EXHIBIT A

Ohio Environmental Protection Agency

Ohio 2016 Integrated Water Quality Monitoring and Assessment Report

Division of Surface Water
Final Report

October 2016

Cover photo: Honey Run Falls in Knox County.

Honey Run is a tributary to the Kokosing River, located in assessment unit 05040003 04 03.

Photo by Russell Gibson

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List of Acronyms and Abbreviations

AmphIBI	amphibian index of biotic integrity
AMP	Atrazine monitoring program
AOC	Area of Concern (as identified under the Great Lakes Water Quality Agreement)
ARRA	American Recovery and Reinvestment Act of 2009
AU	assessment unit
BEACH	Beaches Environmental Assessment and Coastal Health (Act)
BMP	best management practice
BNR	biological nutrient removal
BUI	Beneficial Use Impairment (as described in the Great Lakes Water Quality Agreement)
CABB	Center for Applied Bioassessment and Biocriteria
CAFO	Concentrated Animal Feeding Operations
CDBG	Community Development Block Grant
CDC	Center for Disease Control
cfu	colony forming unit
Corps	U.S. Army Corps of Engineers
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CSO	combined sewer overflow
CSP	Conservation Stewardship Program
CWH	coldwater habitat
CWA	Clean Water Act
DDAGW	Division of Drinking and Ground Waters
DDT	dichlorodiphenyltrichloroethane
DEFA	Division of Environmental and Financial Assistance
DES	Division of Environmental Services
DLG	digital line graph
DRG	digital raster graphic
DSW	Division of Surface Water
EAG	External Advisory Group
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
EWH	exceptional warmwater habitat
FCA	fish consumption advisory
FFY	federal fiscal year
FSA	Farm Service Agency
FWPCA	Federal Water Pollution Control Act
GIS	Geographic Information System
GLLA	Great Lakes Legacy Act
GLRC	Great Lakes Regional Collaboration
GLRI	Great Lakes Restoration Initiative
GLSM	Grand Lake St. Marys
GLWQA	Great Lakes Water Quality Agreement
GRP	Grassland Reserve Program
GRTS	Generalized Random Tessellation Stratified (survey design)
HAB	harmful algal bloom
HSD	honest significant difference

HUC	hydrologic unit code
IBI	index of biotic integrity
ICI	invertebrate community index
IDP	indirect discharge permit
IR	Integrated Report
kg	kilogram
L	liter
LA	load allocation
LAMP	lakewide action and management plan
LCI	Lake Condition Index
LDI	Landscape Development Intensity
LEAU	Lake Erie assessment unit
LEC	(Ohio) Lake Erie Commission
LENT	Lake Erie nutrient targets
LEPF	(Ohio) Lake Erie Protection Fund
LH	lake habitat
LHD	local health district
LRAU	large river assessment unit
LRW	limited resource water
LTCP	long-term control plan
MBI	Midwest Biodiversity Institute
MF	membrane filter
mg	milligram
mi^2	square miles
mL	milliliter
MIwb	modified index of well-being
MOR	monthly operating data
MPN	most probable number
MRBI	Mississippi River Basin Initiative
MS4	municipal separate storm sewer systems
MWH	modified warmwater habitat
NARS	National Aquatic Resource Survey
NCCA	National Coastal Condition Assessment
NCWQR	National Center for Water Quality Research
NEORSD	Northeast Ohio Regional Sewer District
ng	nanogram
NHD	National Hydrography Dataset
NLCD	National Land Cover Dataset
NOAA	National Oceanic and Atmospheric Administration
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
NPS	nonpoint source
NRCS	Natural Resources Conservation Service
NSMP	Nonpoint Source Management Plan
NSSP	National Shellfish Sanitation Program
NWI	National Wetland Inventory
NWQI	National Water Quality Initiative
OAC	Ohio Administrative Code

ODH	Ohio Department of Health
ODNR	Ohio Department of Natural Resources
OMZA	outside mixing zone average
ORC	Ohio Revised Code
ORSANCO	Ohio River Valley Water Sanitation Commission
OSIP	Ohio Statewide Imagery Program
OTMP	Ohio Tributary Monitoring Program
OWDA	Ohio Water Development Authority
OWRC	Ohio Water Resources Council
PAHs	polyaromatic hydrocarbons
PHA	public health advisory
ppb	parts per billion
PCB	polychlorinated biphenyls
PCR	primary contact recreation
PDWS	public drinking water supply
POTW	publicly owned treatment works
PS	point source
PTI	permit to install
PTO	permit to operate
PWS	public water supply
QA	quality assurance
QC	quality control
QDC	qualified data collector
QSC	Quicksilver Caucus
RAP	Remedial Action Plan
RAS	return activated sludge
RF3	Reach File Version 3
RM	river mile
SDWA	Safe Drinking Water Act
SDWIS	Safe Drinking Water Information System
SFY	state fiscal year (July 1 to June 30)
SIU	significant industrial user
sq mi	square miles
SSM	single-sample maximum
STORET	STOrage and RETtrieval (a U.S. EPA water quality database)
SWIF	Surface Water Improvement Fund
SWIMS	Surface Water Information Management System
TDS	total dissolve solids
TMDL	total maximum daily load
TNTC	too numerous to count
TOC	total organic carbon
µg	microgram
USDA	United States Department of Agriculture
U.S. EPA	United States Environmental Protection Agency
USC	United States Code
USGS	U.S. Geological Survey
UV	ultraviolet
VIBI	vegetation index of biotic integrity

VIBI-FQ	VIBI – floristic quality
WAS	waste activated sludge
WAUs	watershed assessment unit
WBLE	western basin of Lake Erie
WEG	(Ohio EPA's) wetland ecology group
WHIP	Wildlife Habitat Incentives Program
WHO	World Health Organization
WLA	wasteload allocation
WPCLF	Water Pollution Control Loan Fund
WQ	water quality
WQC	Water Quality Certification (Section 401)
WQM	Water Quality Management (plan)
WQPSD	Water Quality Permit Support Document
WQS	water quality standards
WRP	Wetlands Reserve Program
WRRSP	Water Resource Restoration Sponsor Program
WSRLA	Water Supply Revolving Loan Account
WWH	warmwater habitat
WWTP	wastewater treatment plant

Executive Summary

The *Ohio 2016 Integrated Water Quality Monitoring and Assessment Report* summarizes water quality conditions in the State of Ohio. The report satisfies Ohio's water quality reporting requirements under Sections 303(d), 305(b) and 314 of the Clean Water Act. The report was last updated in 2014. **Analysis and listing changes are based on data collected during 2013 and 2014 for all uses; recreation and public drinking water supplies uses also included data from 2015, therefore impairment listings may not reflect current conditions**.

Using methods devised to determine the suitability of waters for four specific uses—aquatic life (fish and aquatic insects), recreation (such as boating and swimming), human health (related to fish tissue contamination) and public drinking water supplies—available data were compared with water quality goals. The results indicate which waters are meeting goals and which are not. Waters not meeting the goals for one or more of the four types of uses are referred to as *impaired.* The waters found to be impaired are prioritized and scheduled for further study and restoration.

The report describes the methods used to judge impairment of each type of use and have evolved in each reporting cycle as the Agency gains access to more data and develops better ways to interpret them.

Results are reported for 1,538 watershed units, 38 large river units (in Ohio's 23 rivers that drain more than 500 square miles) and three Lake Erie shoreline units (including waters within 500 yards of public drinking water intakes). Additional information on streams draining between 20 and 500 square miles is presented as this subset of waterbodies is used to calculate and track progress of Ohio's 80 percent full attainment by 2020 goal for wading and principal streams and rivers.

Ohio's large rivers reflected a small decline in percent of monitored miles in full attainment compared to the same statistic reported in the 2014 IR. The "100% full attainment by 2020" aquatic life goal statistic for Ohio's largest rivers now stands at 87.4 percent, down 1.8 percent from the 2014 report. Conversely, smaller streams continue to improve with the average watershed score increasing from 64.2 percent to 66.1 percent of monitored sites in full aquatic life use attainment. The top reasons for aquatic life impairment continue to be sediment, nutrients, habitat modification, hydromodification and organic enrichment.

For the human health use (fish tissue), PCB contamination in fish is the cause of most of the human health impairments in Ohio. Mercury is the second leading cause.

The chemicals of concern causing impairment of the public drinking water supply use include nitrate, atrazine and cyanotoxin (due to certain algae). The primary source of the chemicals is nonpoint source runoff from agricultural land use. Additional sources of nitrate include home and commercial fertilizer application, failing septic systems, unsewered areas and wastewater treatment plant discharges. Of the 123 public drinking water supply assessment units, 19 are now listed as impaired by algae, with another 19 on the watch list for algae (more than double the 2014 report).

The recreation use analysis focuses on the number of bacteria in the water. For Lake Erie public beaches, the frequency of swimming advisories varies widely, ranging from 1.3 percent to over 60

percent. Generally, beaches located near population centers have the most problems. Results are also reported for streams and inland lakes.

Of the 6,316 possible category assignments, the 2016 303(d) list includes changes in 463, with 132 delistings and 331 new listings. Most 303(d) removals and new listings are due to new data.

Changes since the 2014 Integrated Report

Changes made between the 2014 Integrated Report and the 2016 Integrated Report are as follows:

- The Harmful Algal Bloom (HAB) information has been moved from Section I to Section C7.
- The report contains a new section dedicated to Ohio's 303(d)/TMDL Program Vision (Section C8).
- Information was added to the end of Section H regarding an error that was discovered in the 2014 list pertaining to improperly listed PDWS use waters.
- A description of "Near Term Priorities for Ohio EPA" has been added to Section J2.
- The report contains a new subsection discussing Ohio's approach to addressing nutrients in Lake Erie (Section J3), and Lake Erie information has been added or moved to Sections C1 and D3.
- Section L5 (Monitoring and TMDL Schedules for Ohio's Watershed and Large River Assessment Units) was removed from the report; consequently, previous Section "L6" was re-numbered/labeled.

Section

A

An Overview of Water Quality in Ohio

Clean water is important to Ohio's economy and standard of living.

Ohio is an economically important and diverse state with strong agriculture, manufacturing and service industries. Ohio is also a water-rich state bounded by Lake Erie on the north and the Ohio River on the south, with more than 25,000 miles of named and designated streams and rivers within its borders. The suitability of these waters to support society's needs for water supplies and recreation is critical to sustaining Ohio's economy and the standard of living of Ohio citizens. Surface waters such as rivers, streams and lakes provide the majority of water used for public drinking water; for recreation such as swimming, boating, and fishing; and for industrial uses including manufacturing, power generation, irrigation and mining.

Ohio EPA monitors water quality in Ohio and reports its findings.

Monitoring the quality of Ohio's valuable water resources is an important function of the Ohio Environmental Protection Agency (Ohio EPA). Since the early 1970s, Ohio EPA has measured the quality of Ohio's water resources and worked with industries, local governments and citizens to restore the quality of substandard waters. This particular report, updated every two years, is required by the federal Clean Water Act to fulfill two purposes: 1) to provide a summary of the status of the State's surface waters; and 2) to develop a list of waters that do not meet established goals—the "impaired waters."

Under the Clean Water Act, once impaired waters are identified the state must take action to improve them. Typically, the actions include developing restoration plans [total maximum daily loads (TMDLs)], water quality based permits and nonpoint source pollution control measures. As such, this report is an important document that provides information and direction to much of the State's work in water quality planning, monitoring, financial/technical assistance, permitting and nonpoint source programs.

For nearly 40 years, Ohio EPA has developed innovative monitoring methods that directly measure progress toward the goals of the Clean Water Act. Generally recognized as a leader in water quality monitoring, Ohio uses the fish and aquatic insects that live in streams to assess the health of Ohio's flowing waters. Aquatic animals are generally the most sensitive indicators of pollution because they inhabit the water all of the time. A healthy stream community is also associated with high quality recreational opportunities (e.g., fishing and boating). Stream assessments are based on the experience gained through the collection of over 26,000 fish population samples and nearly 13,500 aquatic insect community samples.

In addition to biological data, Ohio EPA collects information on the chemical quality of the water (nearly 210,000 water chemistry samples), sediment and wastewater discharges; data on the contaminants in fish flesh; and physical habitat information about streams. Taken together, this information identifies the factors that limit the health of aquatic life and that constitute threats to human health.

Results show water quality is impaired but continues to improve especially in the smaller watersheds.

Ohio EPA developed methods to determine how well Ohio's waters support four specific uses of water: 1) human health impacts related to fish tissue contamination; 2) recreation; 3) human health impacts related to drinking water; and 4) aquatic life (fish and aquatic insects). Available data were compared with established water quality goals and the results of the comparison indicate which waters are meeting goals and which are not. The results for each use are discussed in the next few pages.

To assess the **human health impacts related to fish tissue contamination**, Ohio EPA uses the same data that are used to generate Ohio's sport fish consumption advisory. Although the data are the same, the analyses are different. Ohio EPA urges Ohio's anglers to consult the sport fish consumption advisory regarding which and how much fish to eat. A link to the fish consumption advisory website is available at the end of this section.

For analysis in this report, approximately half of Ohio's watershed assessment units (WAUs) and one-third of publicly owned lakes have some fish tissue data available. Of those, about 9.5 percent of the WAUs and half of the lakes do not have enough data to determine the impairment status. About one-third of the monitored WAUs are "unimpaired" for the contaminants, while almost two-thirds of the WAUs are "impaired." For lakes, almost 6 percent are impaired while approximately 40 percent are not impaired by the six fish tissue contaminants [mercury, polychlorinated biphenyls (PCBs), chlordane,

mirex, hexachlorobenzene and dichlorodiphenyltrichloroethane (DDT)]. The most common contaminant is PCBs, followed by mercury. A few waters contain fish whose flesh is contaminated by dichlorodiphenyltrichloroethane (DDT), mirex or hexachlorobenzene; data show no streams or lakes with fish contaminated by lead. PCB contamination is widespread usually because of historical sources. Areas with traceable contamination and areas of special concern are being addressed through programs such as the Great Lakes Legacy Act, Superfund or the Resource Conservation and Recovery Act.

Are fish safe to eat?

While most Ohio sport fish are safe to eat, low levels of chemicals like PCBs and mercury have been found in some fish from certain waters.

To help protect the health of Ohioans, Ohio EPA in conjunction with the Ohio Department of Health offers an advisory for how often these fish can be safely eaten. An advisory is advice and should not be viewed as law or regulation. It is intended to help anglers and their families make educated choices about where to fish, what types of fish to eat, how to determine the amount and frequency of fish consumed and how to prepare fish for cooking.

By following these advisories, citizens can gain the health benefits of eating fish while reducing their exposure to unwanted contaminants.

Mercury contamination is ubiquitous because of aerial deposition from local, regional and global sources. Thus, solving the problem of mercury contamination requires solutions on a broader scale than at a watershed level. Ohio is targeting mercury from consumer products such as switches and thermometers through legislation banning the sale of such products. Ultimately, increases in renewable energy sources and clean coal technology usage will lessen Ohio's mercury burden.

Fish populations contaminated by hexachlorobenzene, DDT or mirex are already in the process of being restored through various initiatives in state and federal waste remediation programs.

The **recreation** analysis focuses on the amount of bacteria in the water. For Lake Erie public beaches, the frequency of swimming advisories varies widely, ranging from near zero at South Bass Island State Park and Battery Park beach to nearly 40 percent or more at Arcadia, Bay View West, Edson Creek, Euclid State Park, Lakeshore Park, Lakeview, Sherod and Villa Angela State Park beaches. Generally, beaches located near population centers tend to have the most problems.

Beaches on the Lake Erie islands are nearly always suitable for swimming. Several beaches stand out as consistently good performers over the past several recreation seasons including Battery Park, Bay Park,

Catawba Island, Conneaut, East Harbor State Park, Kelleys Island, Lakeside and South Bass Island State Park. These beaches rarely exceeded the goal of fewer than 10 days per season under advisement.

There were also several beaches that performed consistently poorly with four beaches including Bay view East, Edson Creek, Lakeview and Villa Angela beaches under advisement approaching or over 50 percent of the time during the past five recreation seasons.

For inland streams, approximately half of the total assessment units (AUs) (watershed and large river) had sufficient data to determine the recreation use assessment status in 2016. Of the watersheds assessed, 10 percent fully supported the use while 90 percent did not.

Is it safe to swim or wade?

For the most part, water in Ohio is safe for swimming or wading. Water activities are more dangerous after heavy rains due to the obvious physical dangers of being swept into the faster flows, but also because chemicals and bacteria wash into the streams along with the water that runs over the land. In some communities, sewage systems cannot handle the extra volume of water and release untreated sewage during and after heavy rains.

There are some areas where the waters and/or sediments have high levels of contaminants, including PCBs and polyaromatic hydrocarbons (PAHs), so swimming or wading in these areas is not recommended.

Increased bacteria levels are often observed during periods of higher stream flows associated with heavy rains. Although not sampled as frequently as streams or Lake Erie beaches, bacteria levels at most inland lake beaches do not frequently exceed the threshold, resulting in fewer postings compared to some of the beaches along Lake Erie.

Human health impacts related to drinking water focus on nitrate, pesticides and cyanotoxin (due to certain algae). There are a total of 119 public water systems using surface water (excluding Ohio River intakes). Sufficient data were available to evaluate 43 percent of the drinking water source waters for nitrate.

The only nitrate impaired areas were the Maumee River (the systems for the communities of Defiance, Napoleon, McClure, Wauseon, Bowling Green and the Campbell Soup system) and a portion of the

Is water safe to drink?

Public water systems around the state and Ohio EPA work hard to ensure that the water provided meets safe drinking water standards and to make important information available about the sources and quality of the water you drink. However, drinking water advisories do occur from time to time due to treatment plant malfunctions, water line breaks, and the rare case when source water contaminant levels exceed the plant's capacity to remove them. It is important to remember that only a relatively small number of water systems have situations that warrant advisories. In 2010, 99 percent of all public water systems met all chemical standards. In order to get information about your local drinking water you can read the Consumer Confidence Report (CCR) provided annually by your community water system.

In this report several waters are identified as impaired due to elevated nitrate or pesticides. Water systems in these areas and others with source water contaminants will issue public notice advisories or use additional treatment and water management strategies to assure that safe water is delivered to their customers.

Sandusky River (Fremont). Some areas were identified for a watch list; most were located in the northwestern and central parts of the state. It is difficult and expensive to remove nitrate from drinking water; some systems are conducting nitrate removal pilot studies, but no Ohio surface water systems currently use treatment specific for nitrate removal. Ohio public water systems rely on blending the surface water with other sources such as ground water, selective pumping from the stream to avoid high nitrate levels by using off-stream storage in upground reservoirs or issue public notice advisories warning sensitive populations to avoid drinking the water while nitrate levels are high.

Pesticides could be evaluated for about 21 percent of the drinking water source waters. Five of 19 WAUs were identified as impaired, all in southwestern Ohio: one in Brown County (Mt. Orab); one in Miami County (Piqua); and the three sources used by the Village of Blanchester in Warren and Clinton counties. Eighteen areas were identified for a watch list because of elevated atrazine.

Since the end of the last report cycle, incidents of harmful algal blooms (HABs) impacting Ohio public drinking water supplies have greatly increased. Sufficient data were available to list 19 AUs (15 percent) as impaired. The impairment listing includes the entire Lake Erie Western Basin shoreline, Lake Erie Central Basin shoreline and Lake Erie Island shoreline AUs. In addition, 15 WAUs are now assessed as impaired. These include water supply sources in Lima (Allen County); Bowling Green (Wood County); Clyde (Sandusky County); Norwalk (Huron County), Akron and Barberton (Summit County); Woodsfield (Monroe County); Cadiz (Harrison County); Celina (Mercer County); the Wyanoka Regional Water District (Sardinia – Brown and Harrison Counties); and Clermont County. One large river AU was identified as impaired for algae: Maumee River Mainstem in Bowling Green (Wood County). Sixteen WAUs and three LRAUs are on the algae watchlist.

The bulk of the new data evaluated for the **aquatic life use** is in areas Ohio EPA sampled during 2013 and 2014. Watersheds intensively monitored during 2013 and 2014 included the St. Joseph River, the Tiffin River, the lower Mahoning River, Wolf/Olive Green/Meigs/Rainbow Creeks, Bokes Creek, Stillwater River, the lower Auglaize River, the Rocky River, Wills Creek, Big Darby Creek and Southwest Ohio River Tributaries (Mill, Muddy, Bullskin and Twelvemile Creeks). Detailed survey reports for many of these watersheds are or will be available at http://epa.ohio.gov/dsw/document_index/psdindx.aspx.

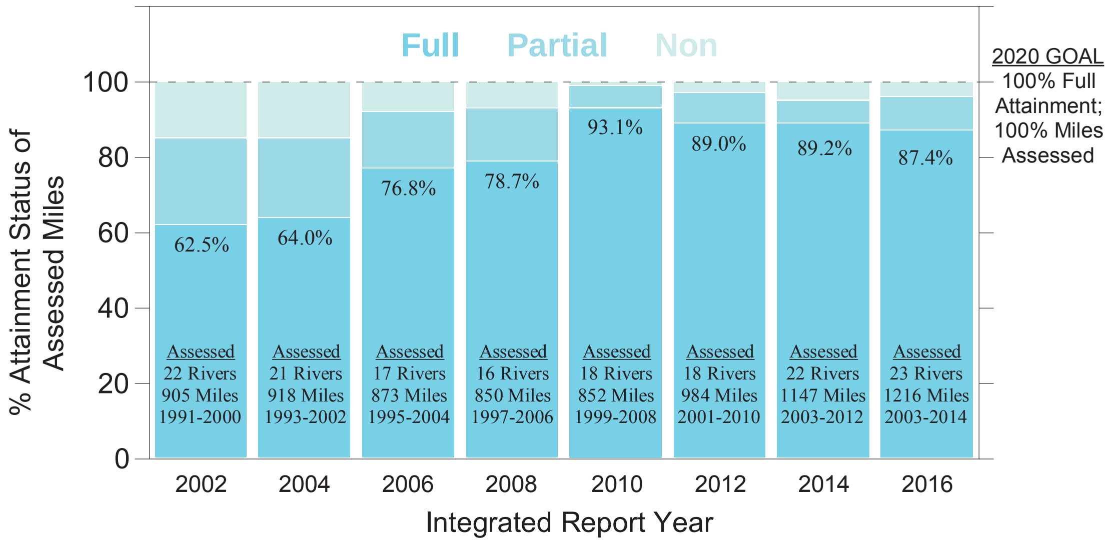
Large rivers are making progress towards the "100% attainment by 2020" aquatic life goal.

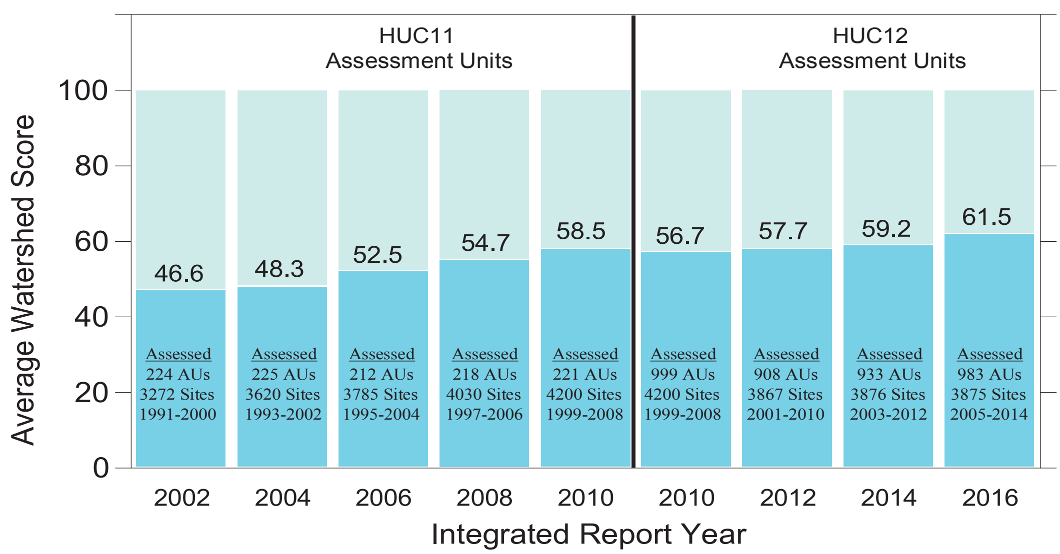
Stream	Year Studied	Percent of Stream Monitored	Percent of Aquatic Life Standard			
			Meeting	Partially meeting	Not meeting	Not known
Mahoning River	1994	100	0	0	100	0
	2013	100	45	45	10	0
Tiffin River	1992	100	0	100	0	0
	2013	100	100	0	0	0
Stillwater River	2010	100	93	7	0	0
	2013	100	95	5	0	0
Wills Creek	1994	100	16	84	0	0
	2014	100	55	45	0	0
Cuyahoga River	2008	77	70	20	10	0
	2014	95	69	17	14	0

Ohio's large rivers (the 23 rivers that drain more than 500 square miles) reflected a small decline in percent of monitored miles in full attainment compared to the same statistic reported in the 2014 IR. The "100% full attainment by 2020" aquatic life goal statistic now stands at 87.4 percent (1063 of 1216 assessed LRAU

miles), down 1.8 percent from the 2014 IR. The table above shows the status of the five large rivers recently sampled. Taken collectively since the 1980s, the quality of aquatic life in all of Ohio's large rivers has shown a remarkable improvement. Then, only 21 percent of the large rivers met water quality standards, increasing to 62 percent in the 1990s, to 87.4 percent today.

Areas not meeting the standards have decreased from 79 percent in the 1980s to 38 percent in the 1990s to 14 percent today. Across Ohio, investment in the treatment of municipal and industrial wastewater and improvement in agriculture conservation practices are credited with the turnaround. The substantial aquatic life improvements observed in these rivers over the last 25 years directly correlate to implementation of agricultural best management practices and upgraded wastewater treatment plants. The ability to track these water quality trends attests to the value of consistent monitoring over time. The following figure shows percent attainment status and goal progress ("100% by 2020") for monitored miles of Ohio's LRAUs.



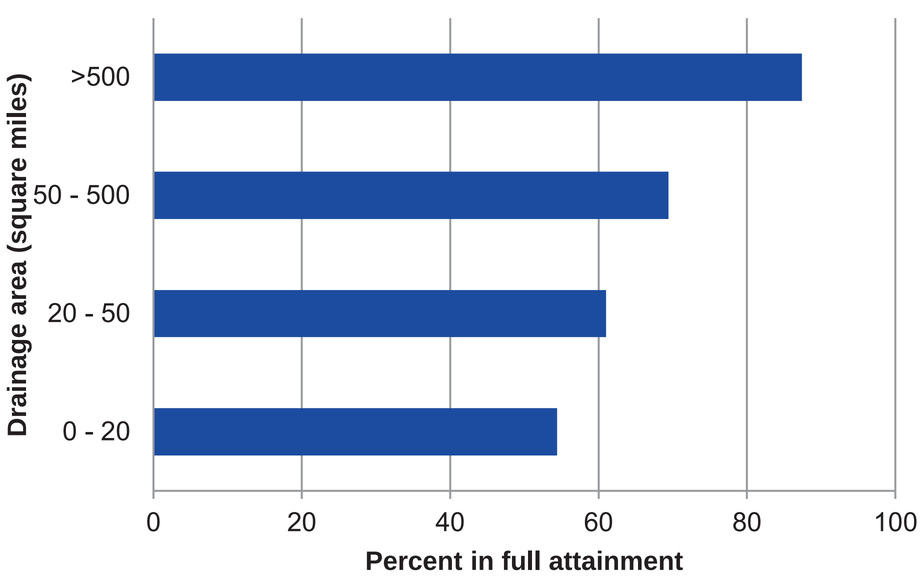


For Ohio's 1,538 12-digit HUCs, the score calculated from measurements at individual sites also continued its steady increase, although with an average score considerably lower than the large river full attainment statistic. Watershed scores are roughly equivalent to the percent of sites within the

watershed unit that are meeting biological expectations and the designated aquatic life use, but some additional weight is given to results from larger stream sites in the unit. Based on monitoring through 2014, the average watershed score is now 61.5 (of watersheds with data), up from 59.2 in 2014. Of the 983 watershed units assessed for this report with current data, 507 (52 percent) scored 80 or above and 420 (43 percent) scored perfect 100s. The graph above shows the average full attainment watershed score for monitored HUC 11 WAUs during reporting cycles from 2002 to 2010 and HUC 12 WAUs during reporting cycles from 2010 to 2016.

The collection of more biological data along the shore of Lake Erie as a result of the Great Lakes Restoration Initiative allows a more current analysis of shoreline conditions. The aquatic life use of the Lake Erie shoreline is impaired due primarily to tributary loadings of nutrients and sediment, aggravated by the proliferation of exotic species, algal blooms and shoreline habitat modifications.

Most aquatic life impairment is caused by land disturbances related to agriculture activities and urban development.

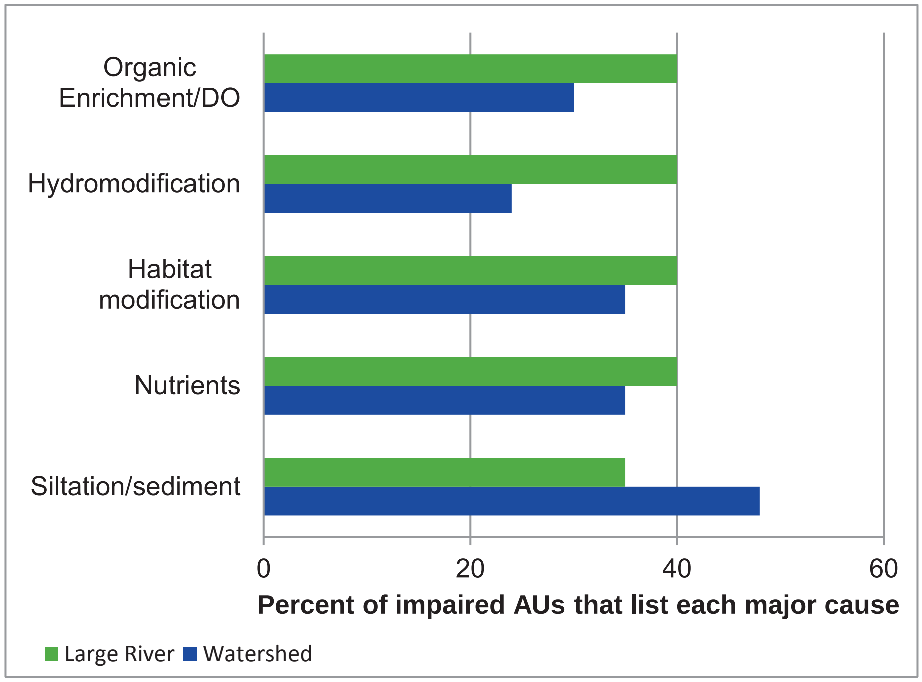


For 0 to 500, based on number of sites in attainment; for > 500, based on number of miles.

Taking a closer look at the attainment status of individual sites grouped by the amount of land area drained by the stream at that point reveals that unhealthy fish and aquatic insect populations are more common on smaller streams (see chart to the left). In other words, the larger the drainage area (and usually the larger the stream), the more likely the stream is to be healthy. This phenomenon correlates well with the most widespread causes associated with the aquatic life impairment in these watersheds.

The top five aquatic life impairment causes for the period 2003 through 2014 are:

- siltation/ sedimentation
- nutrients
- habitat modification
- hydromodification
- organic enrichment/ dissolved oxygen (DO)



For watersheds, most impairment is related to modification of the landscape. These types of impairments have the most impact on smaller streams. Most of the impaired watershed units with current data had at least one of these causes contributing to impairment and many had two or more of the top five causes listed.

Of note is the prevalence of watersheds and large rivers that are impaired by the generic organic enrichment/DO cause category; 30 percent of impaired watersheds show "sewage" related impairments such as high biochemical oxygen demand, elevated ammonia concentrations and/or in-stream sewage solids deposition. This suggests that adequate treatment and disposal of human and animal wastes via wastewater treatment plants; home sewage treatment systems; and land applications of septage and animal manure continue to be critical water quality issues in many Ohio watersheds. The major causes and sources of water quality problems are described below.

Organic enrichment is the addition of carbon-based materials from living organisms beyond natural rates and amounts. Natural decomposition of these materials can deplete oxygen supplies in surface waters. Dissolved oxygen (DO) is vital to fish and other aquatic life and for the prevention of odors associated with the decomposition process.

Siltation/sedimentation describes the deposition of fine soil particles on the bottom of stream and river channels. Deposition typically follows high-flow events that erode and pick up soil particles from the land. Soil particles also transport other pollutants. As the flow decreases, the soil particles fall to the stream bottom. This reduces the diversity of stream habitat available to aquatic organisms.

Habitat modification is the straightening, widening or deepening of a stream's natural channel. Habitat modification can also include the degrading or complete removal of vegetation from stream banks; such vegetation is essential to a healthy stream. These activities can effectively transform a stream from a functioning ecosystem to a simple drainage conveyance. Some aquatic life will not be protected from predators and stressful flows and temperatures. The stream also often loses its ability to naturally process water pollutants.

Hydromodification, or flow alteration, describes any disruption to the natural hydrology of a stream system. Flow alteration includes stream impoundment, increased peak flows associated with the urbanization of watersheds and water-table regulation through sub-surface drainage. Such changes can cause extended periods without stream flow, more extreme or frequent floods and loss of fast current habitat in dam pool areas.

Contamination by pathogens occurs when human or animal waste reaches the stream. Pathogenic organisms include bacteria, viruses and protozoa. Contamination by pathogens is a human health issue, as skin contact or accidental ingestion can lead to various conditions such as skin irritation, gastroenteritis or other more serious illnesses.

Nutrient enrichment describes the excess contribution of materials such as nitrogen and phosphorus used for plant growth. Excess nutrients are not toxic to aquatic life, but can have an indirect effect because algae flourish where excess nutrients exist. The algae die and their decay uses up the dissolved oxygen that other organisms need to live. The aquatic community is stressed on both a daily basis and over the long term.

The same nutrients that cause impairment of the aquatic life beneficial use also are a major contributing factor to the recent extensive HABs that have been observed in Lake Erie, the Ohio River and many inland Ohio water bodies. Grand Lake St. Marys in western Ohio has been particularly affected. HABs, a visually identified concentration of cyanobacteria, can occur almost anywhere there is water: lakes, ponds, storm water retention basins, rivers, streams or reservoirs.

Many HAB-forming organisms are native to Ohio, but only cause problems when environmental conditions favor them. HABs can cause taste and odor problems in drinking waters; pollute beaches with scums; reduce oxygen levels for fish and other animals; cause processing problems for public water supplies; and may generate toxic chemicals. Knowing what triggers HABs is key to reducing their occurrence and impacts. HABs may be minimized, and some completely avoided, by reducing the nutrients and pollutants added to the water.

Understanding how various land uses impact water quality can lead to more effective prevention and restoration.

Ohio has embraced a wide variety of economic enterprises over the past 150 years, so it is not surprising that there is a large variety of causes and sources of impairment some of which are described below.

Row crop cultivation is a common land use in Ohio. Frequently, cultivated cropland involves tile drainage. The challenge is to carry out actions that improve water quality while maintaining adequate drainage for profitable agriculture. The land application of manure, especially during winter months, is often a large source of both bacteria and nutrients entering streams and subsurface drainage tiles. Many cropland practices involve the channelization of streams, which creates deeply incised and straight ditches or streams. This disconnects waterways from floodplains, which has damaging impacts on the quality of the system. The regularity of the stream channel and lack of in-stream cover reduces biological diversity.

Land development is the conversion of natural areas or agriculture to residential, industrial or commercial uses. Numerous scientific studies show that increasing impervious cover (i.e., hard surfaces such as roads, parking lots, and rooftops) harms water quality. More water runs off the hard surfaces and more quickly. The rate of erosion increases and streams become unstable. The resulting channel is less able to assimilate nutrients and other pollution. Higher runoff volume increases the amount of pollutants (e.g., nutrients, metals, sediment, salts and pesticides). Another problem is that stream temperatures can be raised when water runs over hot pavement and rooftops or sits in detention basins. When this heated water enters a stream, the higher temperatures reduce dissolved oxygen

concentrations that aquatic life need to survive. With proper planning of development, many of these problems can be mitigated or avoided entirely.

Agricultural livestock operations can vary widely in how they are managed. Pasture land and animal feeding operations can be sources of nutrients and pathogens. Frequently livestock are permitted direct access to streams. Direct access not only allows the input of nutrients and pathogens, but also erodes the stream bank, causing excess sediments to enter the stream and habitat degradation. The most critical aspect of minimizing water quality impacts from any size animal feeding operation is the proper management of manure in terms of application and storage.

Industrial and municipal point sources include wastewater treatment plants and factories. Wastewater treatment plants can contribute to bacteria, nutrient enrichment, siltation and flow alteration problems. Industrial point sources, such as factories, sometimes discharge water that is excessively warm or cold, changing the temperature of the stream. Point sources may contain other pollutants such as chemicals, metals and solids.

Acid mine drainage impacts streams with high levels of acidity (low pH); high metal concentrations; elevated sulfate levels; and/or excessive dissolved and suspended solids and/or siltation. Acid mine drainage often has toxic effects on stream organisms and degrades habitat quality when deposited metals form a crust on the stream bed and susceptible soils erode from areas disturbed from mining. Ultimately it reduces biological diversity, eliminates sensitive aquatic life, and lowers ecosystem productivity.

Solving Ohio's water quality problems will require collaboration and creativity.

Most of Ohio's water quality problems will not be solved by issuing a permit or building a new wastewater treatment system to treat point sources of pollution. Improving Ohio's surface water quality will require effectively managing land use changes to ensure that polluted runoff is either captured and treated or allowed to infiltrate through the soil before running off into a stream. Restoring and protecting natural stream functions so that pollutants may be more effectively assimilated

by streams is also critical. These actions will require various programs and people working collaboratively on local water quality issues and concerns. Local educational efforts and enhanced water quality monitoring will also play important roles if we are to see significant water quality improvements throughout Ohio.

Many areas of the state are benefitting by the participation of individuals and organizations in local watershed organizations. Some of these organizations have been active for quite some time and are successfully influencing local land use decision making and implementing projects designed to improve water quality in their watershed. Since 2000, Ohio EPA has worked in conjunction with the Ohio Department of Natural Resources (ODNR) to provide section 319(h) grant funding assistance to hire local watershed coordinators to help facilitate the development of watershed action plans. In recent years, the emphasis has shifted from developing plans to implementing water quality improvement projects such as stream restoration, dam removals, agricultural best management practices and others. Ohio EPA is measuring improvements resulting from these projects; however, there remain challenges associated with changing land use decisions and finding cooperative partners.

Ohio EPA is also actively working with ODNR and the Ohio Department of Health (ODH) to protect people from toxins produced by cyanobacteria that may be in recreational waters at concentrations that can affect human health. The strategy outlines thresholds for identified algal toxins, establishes monitoring protocols and identifies the process for posting and removing recreation use advisories. Furthermore, a web site was established to provide background information about HABs; tips for staying safe when visiting public lakes; links to sampling information and current advisories; and contact information for reporting suspected HABs. A link to this website is at the end of this section.

The report provides more detail, including Ohio's Section 303(d) list of impaired waters, as required by the Clean Water Act.

This overview is intended to provide a summary of water quality conditions, progress and challenges in Ohio; it is only the first section of the much larger and more detailed 2016 Integrated Report.

The opening sections of the report describe the universe of water quality in Ohio—the size and scope of Ohio's water resources, programs that are used to evaluate and improve water quality and funding sources for water quality improvement.

The middle sections are more technical and explain the beneficial uses assigned to Ohio's waters; the assessment methodologies used for the analyses of those uses; the data used to determine whether those uses are being supported; and the conclusions drawn about water quality conditions in each AU.

The closing sections describe how waters found to be impaired will be scheduled for further study. A collection of maps that illustrate current conditions and future plans follow the text. The report concludes with summary tables of various types. The 303(d) list is contained in Section L4. Summaries of the condition of each AU are available through the "Interactive Maps" link at http://epa.ohio.gov/dsw/tmdl/OhioIntegratedReport.aspx.

For more information, please consult these web sites:

Many water quality reports on specific watersheds are mentioned in this overview. Find these reports at http://www.epa.ohio.gov/dsw/document_index/psdindx.aspx

Watershed restoration reports (TMDLs) … http://www.epa.ohio.gov/dsw/tmdl/index.aspx

Fish consumption advisory … http://www.epa.ohio.gov/dsw/fishadvisory/index.aspx

Harmful algal blooms … www.ohioalgaeinfo.com

Ohio Department of Health Beachguard (bacteria and algae)…
http://publicapps.odh.ohio.gov/BeachGuardPublic/Default.aspx

Integrated Report … http://www.epa.ohio.gov/dsw/tmdl/OhioIntegratedReport.aspx

Ohio EPA Division of Surface Water … http://www.epa.ohio.gov/dsw/SurfaceWater.aspx

Ohio EPA Division of Drinking and Ground Waters …
http://www.epa.ohio.gov/ddagw/DrinkingandGroundWaters.aspx

Ohio EPA district office contact info … http://www.epa.ohio.gov/directions.aspx

List of Ohio watershed groups … http://ohiowatersheds.osu.edu/watershed-groups

Ohio Department of Agriculture, Soil and Water Conservation …
http://www.agri.ohio.gov/divs/SWC/SWC.aspx

U.S. Environmental Protection Agency water program … http://water.epa.gov/

Section

B

Ohio's Water Resources

B1. Facts and Figures

Ohio is a water-rich state bounded on the south by the Ohio River and the north by Lake Erie. These water bodies, as well as thousands of miles of inland streams and rivers and thousands of acres of lakes and wetlands, contribute to the quality of life of Ohio's citizens. The size and scope of Ohio's water resources are outlined in Table B-1.

The larger water bodies included in Table B-1 comprise the major aquatic resources that are used and enjoyed by Ohioans for water supplies, recreation and other purposes. The quality of these perennial streams and other larger water bodies is strongly influenced by the condition and quality of the small feeder streams, often called the headwaters. Approximately 28,900 miles of the over 58,000 miles of stream channels digitally mapped in Ohio are headwater streams. However, the digital maps currently available for Ohio do not include the smallest of headwater channels. Results of a special study of primary headwater streams (drainage areas less than 1 mi^2) place the estimate of primary headwaters between 146,000 to almost 250,000 miles (Ohio EPA 2009). Some of these primary headwater streams are in fact perennial habitats for aquatic life that supply base flow in larger streams. This illustrates the importance of taking a holistic watershed perspective in water resource management.

The named streams and rivers that are readily recognized by the public are mostly those that drain more than 50 mi^2. These 254 principal streams and large rivers in Ohio (comprising 5,679 linear stream miles) are listed by major Ohio watershed in Table B-2. Figure B-1 graphically depicts the extent of these stream and river miles within Ohio.

Ohio is an economically important and diverse state with strong manufacturing and agricultural industries. Many of the historical patterns of environmental impact in Ohio are related to the geographical distribution of basic industries, land use, mineral resources and population centers. Also important, however, is an understanding of Ohio's geology, land form, land use and other natural features as these determine the basic characteristics and ecological potential of streams and rivers. Ohio EPA bases the selection; development and calibration of ecological; toxicological; and chemical/physical indicators on these factors. These indicators are then used via systematic ambient monitoring to provide information about existing environmental problems; threats to existing high quality waters; and successes in abating water pollution problems in Ohio's surface waters.

Fourteen river systems in Ohio are included in the State Scenic Rivers Program, administered by the Ohio Department of Natural Resources (see Figure B-2). Between 1970 and 2008, a total of 674 miles were designated Scenic; 75 miles in three systems were designated Wild; and 79 miles in two systems were designated Recreational. Portions of three stream systems—the Little Miami, Little Beaver Creek and Big and Little Darby Creek—are also included in the National Wild and Scenic System. The total Ohio stream miles included in the national designation is 207 miles. More information on Ohio's scenic rivers can be found at http://watercraft.ohiodnr.gov/scenicrivers.

Table B-1. Ohio's water resource statistics.

Metric	Value	Source	Scale
State population	11,536,504	2010 Census[1]	
Land area	40,948 sq miles	2003 Census	
Rivers and streams			
Miles of named and designated streams	> 23,000	ODNR[2]	1:24K
Total miles	58,343	NHD[3]	1:24K
Miles of perennial streams	29,412	NHD	1:24K
Miles of intermittent streams	28,931	NHD	1:24K
Miles of primary headwater streams	> 115,000	Ohio EPA[4]	
Miles of large rivers (draining more than 500 square miles)	1,248	NHD	1:24K
Miles of principal streams (draining 50 to 500 square miles)	4,453	NHD	1:24K
Border miles: Ohio River	451	USGS 7 1/2' Maps	1:24K
Border miles: Lake Erie shoreline	290	USGS 7 1/2' Maps	1:24K
Lakes/Reservoirs/Ponds			
Number of significant publicly owned lakes	447	ODNR[5]	1:24K
Total acreage of significant publicly owned lakes	118,963	ODNR[5]	1:24K
Wetlands			
Acreage	507,057	Ohio EPA[6]	1:24K
Percent of original wetlands	10 percent	Dahl[7]	

[1] Source: http://www.census.gov/2010census/data/

[2] Mileage figure for waters listed by Ohio Department of Natural Resources in *Gazetteer of Ohio Streams, 2nd edition* (ODNR 2001).

[3] An estimate prepared from a computer-digitized map of U.S. streams and rivers produced by the U.S. Geological Survey (USGS) known as the National Hydrography Dataset (NHD). The NHD is based upon the content of USGS Digital Line Graph (DLG) hydrography data integrated with reach-related information from the U.S. EPA Reach File Version 3 (RF3). http://nhd.usgs.gov/index.html.

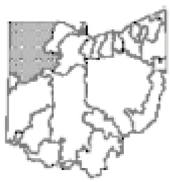
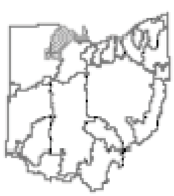
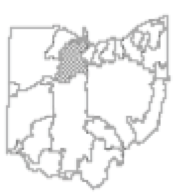
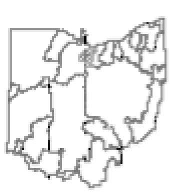
[4] An estimate prepared by Ohio State University for Ohio EPA and reported in "Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams" (Ohio EPA 2009).

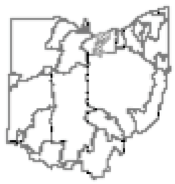
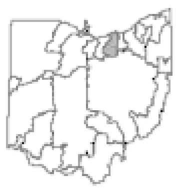
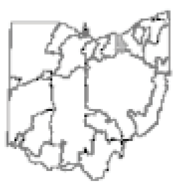
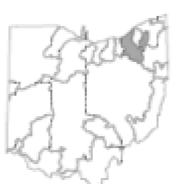
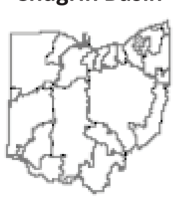
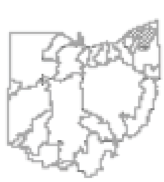
[5] Acreage figure for significant publicly owned lakes (> 5 acres) listed by Ohio Department of Natural Resources in "Inventory of Ohio's Lakes" (ODNR 1980).

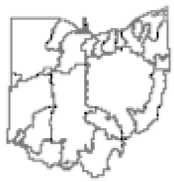
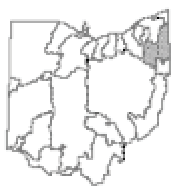
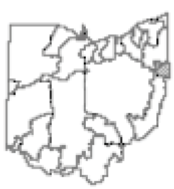
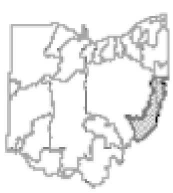
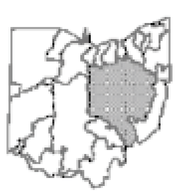
[6] Acreage figure for wetlands listed by Ohio EPA in "Intensification of the National Wetland Condition Assessment for Ohio: Final Report" (Ohio EPA 2015).

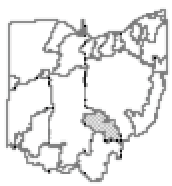
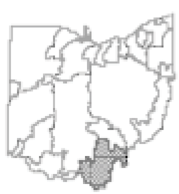
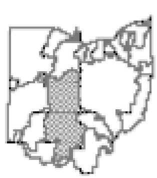
[7] Loss of historic wetlands in Ohio estimated to be 90 percent (Dahl, 1990).

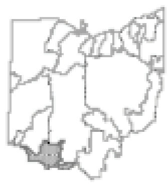
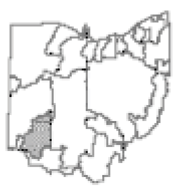
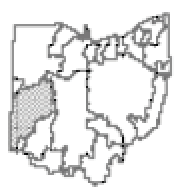
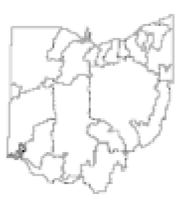
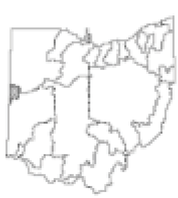
Table B-2. List of Ohio's principal streams and large rivers.

Basin	Large Rivers (draining >500 mi^2)	Principal Streams (draining >50 mi^2 but less than 500 mi^2)	
Areas draining to Lake Erie			
Maumee Basin 	Maumee River Auglaize River Blanchard River Tiffin River	Swan Creek Beaver Creek Bad Creek South Turkeyfoot Creek North Turkeyfoot Creek Flatrock Creek Powell Creek North Powell Creek Blue Creek Little Auglaize River Prairie Creek West Branch Prairie Creek Dog Creek Riley Creek Ottawa Creek Eagle Creek Ottawa River	Sugar Creek Hog Creek Jennings Creek Ottawa River Tenmile Creek St. Joseph River Fish Creek Nettle Creek West Branch St. Joseph River East Branch St. Joseph River St. Marys River Black Creek Mud Creek Lick Creek Brush Creek Bean Creek
Portage Basin 		Portage River Sugar Creek North Branch Portage River Toussaint Creek	South Branch Portage River Middle Branch Portage River Rocky Ford
Sandusky Basin 	Sandusky River	Wolf Creek East Branch Wolf Creek Sycamore Creek Broken Sword Creek	Green Creek Honey Creek Muddy Creek Tymochtee Creek
Huron Basin 		Huron River East Branch Huron River West Branch Huron River	

Basin	Large Rivers (draining >500 mi2)	Principal Streams (draining >50 mi2 but less than 500 mi2)
Vermilion Basin 		Vermilion River
Black Basin 		Black River East Branch Black River West Branch Black River
Rocky Basin 		Rocky River East Branch Rocky River West Branch Rocky River
Cuyahoga Basin 	Cuyahoga River	Tinkers Creek Breakneck Creek Little Cuyahoga River
Chagrin Basin 		Chagrin River Aurora Branch
Grand Basin 	Grand River	Mill Creek Rock Creek

Basin	Large Rivers (draining >500 mi^2)	Principal Streams (draining >50 mi^2 but less than 500 mi^2)	
Ashtabula Basin 		Ashtabula River Conneaut Creek	
		Areas draining to the Ohio River	
Mahoning Basin 	Mahoning River	Meander Creek Mill Creek Mosquito Creek	Eagle Creek West Branch Mahoning River Pymatuning Creek
Little Beaver Basin 		Little Beaver Creek Bull Creek	North Fork Little Beaver Creek Middle Fork Little Beaver Creek West Fork Little Beaver Creek
Central Ohio Tributaries 		Captina Creek Cross Creek Duck Creek East Fork Duck Creek West Fork Duck Creek Little Muskingum River	McMahon Creek Short Creek Sunfish Creek Wheeling Creek Yellow Creek North Fork
Muskingum Basin 	Muskingum River Licking River Tuscarawas River Walhonding River Mohican River Wills Creek	Wolf Creek South Branch Wolf Creek West Branch Wolf Creek Olive Green Creek Conotton Creek Indian Fork Killbuck Creek Doughty Creek Apple Creek Rocky Fork Licking River South Fork Licking River Raccoon Creek North Fork Licking River Moxahala Creek Jonathan Creek	Wolf Creek Chippewa Creek Mill Creek Kokosing River Jelloway Creek North Branch Kokosing River Lake Fork Mohican River Muddy Fork Mohican River Jerome Fork Mohican River Black Fork Mohican River Rocky Fork Mohican River Clear Fork Mohican River Salt Fork Wills Creek Sugartree Fork Crooked Creek

Basin	Large Rivers (draining >500 mi^2)	Principal Streams (draining >50 mi^2 but less than 500 mi^2)	
Muskingum Basin (continued)		Stillwater Creek Little Stillwater Creek Brushy Fork Sugar Creek South Fork Sugar Creek Sandy Creek Nimishillen Creek Still Fork White Eyes Creek	Leatherwood Creek Seneca Fork Buffalo Fork Little Hocking River Meigs Creek Salt Creek Wakatomika Creek Little Wakatomika Creek
Hocking Basin 	Hocking River	Margaret Creek Federal Creek Sunday Creek Monday Creek	Clear Creek Rush Creek Little Rush Creek
Southeast Ohio Tributaries 	Raccoon Creek	Indian Guyan Creek Leading Creek Little Scioto River Rocky Fork Little Scioto River Pine Creek Little Raccoon Creek	Elk Fork Shade River East Branch Shade River Middle Branch Shade River West Branch Shade River Symmes Creek Black Fork
Scioto Basin 	Scioto River Paint Creek	Big Beaver Creek Peepee Creek Walnut Creek Scippo Creek Walnut Creek Big Walnut Creek Mill Creek Alum Creek Blacklick Creek Bokes Creek Little Scioto River Rush Creek Big Darby Creek Little Darby Creek Deer Creek Sugar Run Olentangy River	Whetstone Creek North Fork Paint Creek Compton Creek Rocky Fork Paint Creek Rattlesnake Creek Lees Creek West Branch Rattlesnake Creek Sugar Creek East Fork Paint Creek Salt Creek Salt Lick Creek Middle Fork Salt Creek Laurel Run Scioto Brush Creek South Fork Scioto Brush Creek Sunfish Creek

Basin	Large Rivers (draining >500 mi^2)	Principal Streams (draining >50 mi^2 but less than 500 mi^2)	
Southwest Ohio Tributaries 		Bullskin Creek Eagle Creek West Fork Eagle Creek Ohio Brush Creek Baker Fork	West Fork Ohio Brush Creek Straight Creek White Oak Creek East Fork White Oak Creek North Fork White Oak Creek
Little Miami Basin 	Little Miami River	O'Bannon Creek Turtle Creek East Fork Little Miami River Stonelick Creek Todd Fork	Cowan Creek Caesar Creek Anderson Fork Massies Creek
Great Miami Basin 	Great Miami River Mad River Stillwater River Whitewater River	Indian Creek Clear Creek Bear Creek Wolf Creek Honey Creek Lost Creek Tawawa Creek Stony Creek Buck Creek Ludlow Creek	Greenville Creek Swamp Creek Dry Fork Fourmile Creek Sevenmile Creek Twin Creek Loramie Creek Muchinippi Creek South Fork Great Miami River
Mill Basin 		Mill Creek	
Wabash Basin 		Wabash River Beaver Creek	

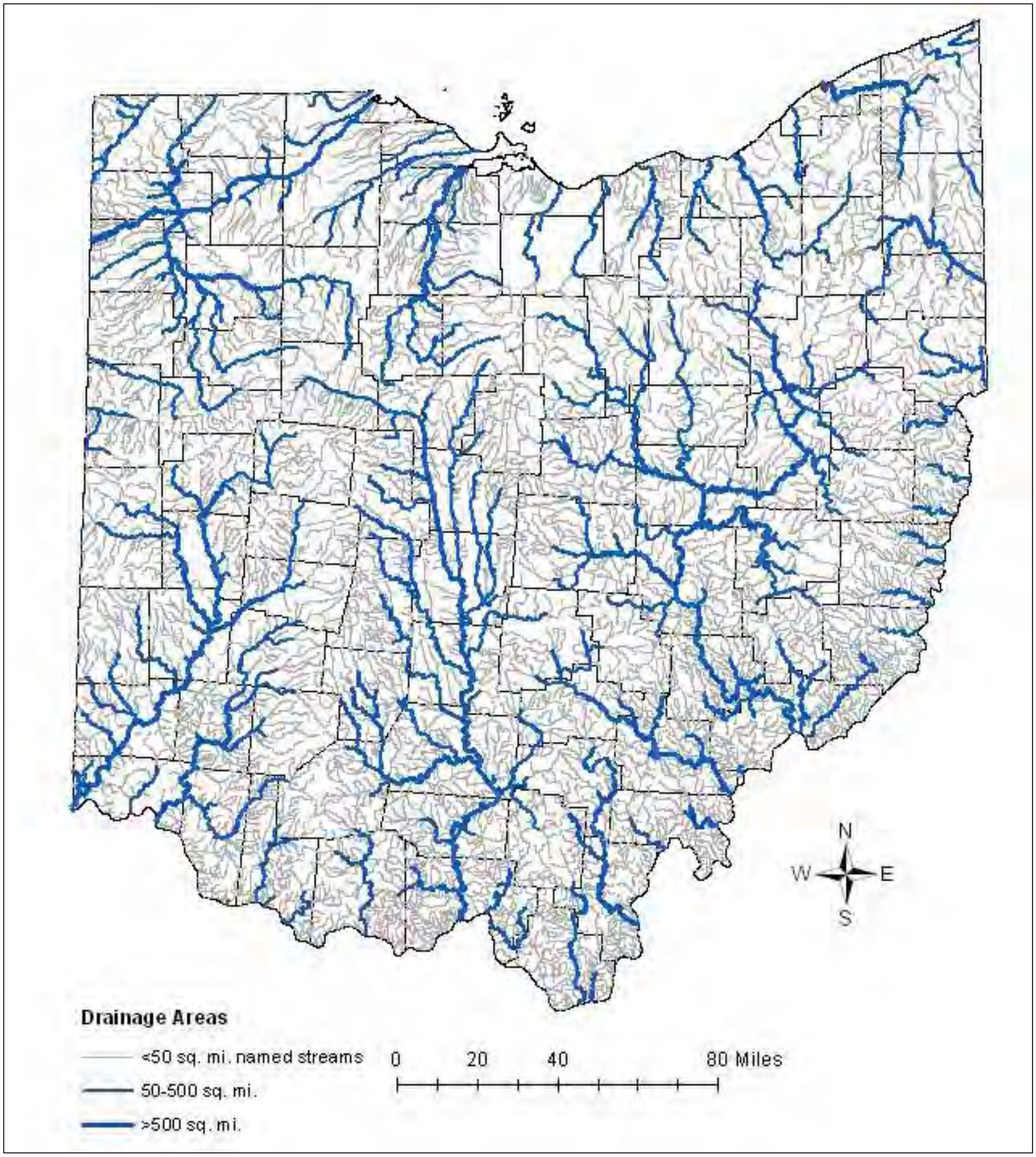


Figure B-1. Map of Ohio's principal streams and large rivers.

Figure B-2. Ohio Scenic River System (ODNR 2015).
Source: http://watercraft.ohiodnr.gov/scenicriversmap (last visited 9/24/2015)

B2. 2020 Water Quality Goals

As has been shown, Ohio has a variety of high quality water resources. Ohio has set goals to track trends in water quality for many years. In the early 1990s, Ohio EPA established a goal of fully attaining the designated aquatic life use[1] in 80 percent of Ohio's streams and rivers by 2010. The purpose of the goal was not to supersede the Clean Water Act goal of 100 percent attainment for all uses, but rather to provide a reasonable target against which to track water quality improvements in Ohio. The 2010 Integrated Report marked the final accounting of "80 by 2010" goal progress and proposed new goals for the aquatic life beneficial use.

New goals for all four beneficial uses included in the Integrated Report (IR) were established in the 2012 report. Progress toward these goals is discussed in each IR cycle. Table B-3 lists the goal, the statistic that will be tracked to measure progress and the baseline and current status for each goal. See Section G for more information about the aquatic life use goal.

[1] Beneficial use designations describe existing or potential uses of water bodies. See Section D4 for additional description.

Table B-3. 2020 goals for four beneficial uses, Lake Erie and the Ohio River.

Goal	Statistic to be Tracked	Baseline	Update
Public Drinking Water Supply Use			
All drinking water sources will attain WQS by 2020	Of those assessed, percent (%) intakes/assessment units attaining for nitrates, atrazine and cryptosporidia	Nitrate: 93% attainment Atrazine: 71% attainment Crypto: insufficient data Source: 2010 IR Data range: 2004-2008	Nitrate: 91% attainment Atrazine: 81% attainment Crypto: 100% attainment[1] Source: 2016 IR Data range: 2010-2015
All drinking water sources will be assessed (nitrate and atrazine) by 2020	% intakes/zones assessed	Nitrate: 34% assessed Atrazine: 13% assessed Source: 2010 IR Data range: 2004-2008	Nitrate: 43% assessed Atrazine: 21% assessed Source: 2016 IR Data range: 2010-2015
Recreation Use			
Ohio beaches and canoeing streams will be safe for swimming (meet WQS) by 2020	Lake Erie beaches below *E. coli* WQS on 90% of recreation days (single sample maximum), using most recent 5 years of data	5 of 22 (22%) major public beaches met target (*note: one beach from 2010 report is not public now*) Source: 2010 IR Data range: 2004-2008	8 of 65 (12%) public beaches met target Source: 2016 IR Data range: 2011-2015
	For state park beaches, 90% of *E. coli* samples collected in past 5 years are below the bathing beach *E. coli* criterion	57 of 77 (75%) state park beaches met target Source: 2010 IR Data range: 2004-2008	46 of 68 (67%) state park beaches met target Source: 2016 IR Data range: 2011-2015
	% of assessed stream sites meeting seasonal geo mean *E. coli* criteria, using most recent 5 years of data	Aggregate: 587 of 1,598 (37%) Class A: 165 of 349 (47%) Class B: 419 of 1,229 (34%) Class C: 3 of 20 (15%) Source: 2010 IR Data range: 2004-2008	Aggregate: 1,031 of 3,803 (27%) Class A: 556 of 1,621 (33%) Class B: 473 of 2,172 (22%) Class C: 2 of 10 (20%) Source: 2016 IR Data range: 2011-2015
Maintain adequate monitoring coverage on Ohio's watersheds, large rivers and beaches	# of sites assessed (bacteria data in 5-year period)	Watersheds: 472 of 1,538 (31%) assessed Large rivers: 15 of 38 (40%) assessed Beaches: 22 of 22 (100%) assessed (*note: one beach from 2010 report is not public now*) Source: 2010 IR Data range: 2004-2008	Watersheds: 697 of 1,538 (45%) assessed Large rivers: 17 of 38 (45%) assessed Beaches: 65 of 65 (100%) assessed Source: 2016 IR Data range: 2011-2015

Goal	Statistic to be Tracked	Baseline	Update
Human Health Use (Fish Tissue)			
More fish from Ohio's waters will be safe to eat by 2020	Levels of contaminants (mercury & PCBs) in sport fish compared with level in 2010	Not applicable	To be calculated in 2019 with 2009-2018 data.
	Number of AUs listed as impaired for fish consumption compared to the 2010 IR	33% of AUs were impaired and 87% of LRAUs Source: 2010 IR Data range: 1999-2008	To be calculated in 2019 with 2009-2018 data.
Aquatic Life Use			
100% full aquatic life use attainment on all Ohio large rivers by 2020	% assessed miles in full attainment of biological WQS criteria (Large rivers drain more than 500 square miles.)	93% (794 of 852 large river miles assessed) Total large river miles assessed: 852 of 1227 (69%) Source: 2010 IR Data range: 1999-2008	87.4% (1063 of 1216 large river miles assessed) Total large river miles assessed: 1216 of 1248 (98%) Source: 2016 IR Data range: 2003-2014
80% full aquatic life use attainment on Ohio's principal streams and small rivers by 2020	% assessed sites in full attainment of biological WQS criteria (Principal stream and small river sites drain between 20 and 500 square miles.)	61% (944 or 1,538 principal stream and small river sites assessed) Source: 2010 IR Data range: 1999-2008	66% (1063 of 1608 principal stream and small river sites assessed) Source: 2016 IR Data range: 2005-2014
Identify more high quality waters	Designate an additional 500 miles of stream, small river and large river reaches from undesignated, WWH, or other lower tier aquatic life use to EWH	2,222 field verified EWH miles Source: Ohio WQS (OAC 3745-1, effective 10/9/09) Data range: 1990-2007	2811 field verified EWH miles, (current as of WQS use designation rulemakings effective 11/30/2015, plus additional field verifications of existing and recommended EWH use in select basins sampled from 2009-2014). Net new miles since 2010 IR baseline: 589 (96 recommended or field verified EWH stream and river reaches) For this cycle, 266 miles (35 recommended or field verified EWH stream or stream reaches) Source: Ohio WQS (OAC 3745-1) and basin TSDs

Goal	Statistic to be Tracked	Baseline	Update
Maintain adequate monitoring coverage on Ohio's principal and small rivers	# of sites assessed in 10-year period that have between 20- to 500-square-mile drainage area	1,538 sites Source: 2010 IR Data range: 1999-2008	1608 sites Source: 2016 IR Data range: 2005-2014
Monitoring Load Reduction Progress for Lake Erie and the Ohio River			
Develop and begin to implement a strategy for adequate monitoring coverage to calculate loadings from all significant watersheds to Lake Erie and the Ohio River	# of sites at or near the mouths of major watersheds that have flow gages and water quality sampling frequently enough to calculate loads with an acceptable degree of certainty (e.g. following Northeast-Midwest Institute or GLWQA Annex 4 recommendations)	Nine watersheds currently have flow gages and daily monitoring near the mouth of the watershed: Maumee, Portage, Sandusky, Cuyahoga, Muskingum, Scioto, and the Great Miami. Two watersheds which may have adequate data now, but are funded by short-term grants: Vermillion and Black.	Goal established 2016

[1] Using the proposed criteria listed in Table H-1.

Section

C

Managing Water Quality

Ohio EPA and other state government departments are directed by the Ohio General Assembly to manage Ohio's water resources. The U.S. Environmental Protection Agency (U.S. EPA) has also delegated to Ohio EPA the responsibility to administer certain federal programs in Ohio.

The functions of various water quality management programs are explained in this section, along with a description of some funding expenditures for water quality activities in Ohio. Some federal government programs are included. Local government programs and decisions (e.g., ordinances, planning and zoning) can have major impacts on water quality, but are not described here.

C1. Program Summary – Surface Water

The goal of Ohio EPA's Division of Surface Water (DSW) is to restore and maintain Ohio's water resources. This goal reflects the national water quality objective as contained in the federal Clean Water Act (CWA), which is "... to restore and maintain the chemical, physical and biological integrity of the Nation's waters"—often referred to as the "fishable/swimmable goal." Fishable/swimmable waters are resources that support stable, balanced populations of aquatic organisms that are ecologically "healthy" and provide safe water to the people of Ohio for public and industrial water supplies and recreation.

DSW has a full time staff of approximately 200 located in Columbus and the five Ohio EPA district offices. The division also employs approximately 50 interns during the summer to assist with biological and chemical water quality surveys. Funding for the division is comprised of federal monies, environmental protection funds generated through solid waste dumping fees and annual discharge fees.

A watershed-based approach to assessments and delivery of services has been a program management objective within DSW for nearly two decades. In 1990, DSW initiated an organized, sequential approach to monitoring and assessment (the "Five-Year Basin Approach") to better coordinate the collection of ambient monitoring data so that information and reports would be available in time to support water quality management activities such as the issuance of National Pollutant Discharge Elimination System (NPDES) permits and periodic revision of the Ohio water quality standards (WQS).

To establish the framework, the State was divided into 25 different areas that were aggregations of subbasins within major river basins. Each of the 25 areas were assigned to one of the five basin years, taking into account the need to appropriately distribute the monitoring workload among Ohio EPA's five district offices. The initial 1990 workload estimates and resource planning indicated that five years would be needed to complete the cycle of monitoring. However, the monitoring program has never been fully funded to meet those resource needs and thus the monitoring cycle takes more than 10 years to complete.

The Five-Year Basin Approach and the core work of the biological and water quality monitoring program have gradually become the Division's assessment component within the Total Maximum Daily Load (TMDL) program. Ohio's TMDL program has been designed to be watershed-focused and to promote integration of other ongoing water program elements on a watershed basis.

Biological and Water Quality Surveys

Ohio EPA routinely conducts biological and water quality surveys, or biosurveys, on a systematic basis throughout the state. A biosurvey is an interdisciplinary monitoring effort coordinated on a reach specific or watershed scale. Such efforts may involve a relatively simple setting focusing on one or two small streams, one or two principal stressors and a handful of sampling sites or a much more complex

effort including entire drainage basins, multiple and overlapping stressors and tens of sites.

Each year Ohio EPA conducts biosurveys in four to six major watersheds in Ohio with an aggregate total of 400 to 450 sampling sites. Biological, chemical and physical habitat monitoring and assessment techniques are employed in biosurveys in order to meet four major objectives:

1. to provide a current and thorough assessment of water quality conditions in watersheds that are scheduled for TMDLs in the near future (1-3 years);
2. to determine the extent to which use designations assigned in the Ohio WQS are either attained or not attained;
3. to determine if use designations assigned to a given water body are appropriate and attainable and recommend designations or changes where needed; and
4. to determine if any changes in key ambient biological, chemical, or physical indicators have taken place over time, particularly before and after the implementation of point source pollution controls or best management practices (BMPs).

The data gathered by a biosurvey is processed, evaluated and synthesized in a biological and water quality report. The findings and conclusions of each biological and water quality study may factor into regulatory actions taken by Ohio EPA and are incorporated into the Ohio WQS (OAC 3745-1), Water Quality Permit Support Documents (WQPSDs), State Water Quality Management Plans, the Ohio Nonpoint Source (NPS) Assessment and the aquatic life beneficial use analysis in the Ohio Integrated Water Quality Report [this report, prepared to meet the requirements of CWA Sections 305(b) and 303(d)] and TMDLs.

Additional information on DSW's water quality monitoring and assessment program is available at the following web site: http://www.epa.ohio.gov/dsw/bioassess/ohstrat.aspx. An index with links to available biological and water quality reports can be found at the following web site: http://www.epa.ohio.gov/dsw/document_index/psdindx.aspx.

Biosolids

Sewage sludge is the solid, semisolid or liquid residue generated during the treatment of domestic sewage in a treatment facility. When treated and processed for beneficial use, sewage sludge becomes biosolids—nutrient-rich organic materials that can be safely recycled and applied as fertilizer. Only biosolids that meet the standards spelled out in the Federal and state rules can be approved for use as a fertilizer. Publicly Owned Treatment Works (POTWs) make the decision whether to recycle the biosolids as a fertilizer, incinerate it or bury it in a landfill.

Ohio EPA received delegation to administer the Biosolids Program (CWA Section 503 Program) in 2005. In March 2000, House Bill (HB) 197 was passed by the Ohio General Assembly to provide the statutory authority for the director of Ohio EPA to seek delegation of the program. HB 197 modified the Ohio Revised Code (ORC) to provide the director of Ohio EPA the authority to adopt, enforce, modify and rescind rules necessary to implement the Biosolids Program. HB 197 also modified the ORC to include an annual sewage sludge fee in order to fund the program. Each dry ton of sewage sludge, treated or disposed in the State of Ohio, is assessed a fee with a cap of $600,000 per year on all monies collected. Shortly after the passage of HB 197, Ohio EPA began drafting rules that became effective in April 2002, as Ohio's Sewage Sludge Rules: Chapter 3745-40 of the Ohio Administrative Code (OAC). The purpose of Chapter 3745-40 of the OAC is to "establish standards applicable to the disposal, use, storage, or treatment of sewage sludge or biosolids, which standards are intended to reasonably protect public

health and the environment, encourage the beneficial use of biosolids and minimize the creation of nuisance odors." The most recent version of OAC 3745-40 became effective in July 2011.

Funded by annual sludge fees, Ohio EPA hired employees to cover sewage sludge management duties in the field and office. These employees perform compliance evaluation inspections at POTWs that beneficially use biosolids. They review annual data submitted by POTWs to ensure compliance with pollutant limits, monitoring and reporting requirements and perform authorization inspections at proposed land application sites. Field reconnaissance inspections are conducted at land application sites to verify compliance with site restrictions and management practices. These employees also review the NPDES permits that regulate sewage sludge generators.

Ohio EPA also funded college interns through the annual sludge fees to track authorized biosolids application sites. The interns developed a Geographic Information System (GIS) project to add authorized biosolids sites to a digital base map. Each authorized biosolids site receives a unique identification number through the GIS program. The GIS project is useful for managing the numerous land application sites and associated data such as cumulative pollutant loadings rates or proximity to source water protection areas for public drinking water supplies.

Combined Sewer Overflow Control Program

Combined sewers were built to collect sanitary and industrial wastewater, as well as storm water runoff and transport these combined waters to a wastewater treatment plant (WWTP). During dry weather, they are designed to transport all flow to the WWTP. When it rains, the volume of storm water and wastewater may exceed the capacity of the combined sewers or of the WWTP. When this happens, the combined sewers are designed to allow a portion of the combined wastewater to overflow into the nearest stream, river or lake. This is a combined sewer overflow (CSO). Ohio has approximately 1141 known CSOs in 89 CSO communities (February 2016), ranging from small, rural villages to large metropolitan areas.

In 1994, U.S. EPA published the national CSO Control Policy. Working from the national policy, Ohio EPA issued its CSO Control Strategy in 1995. The primary goals of Ohio's Strategy are to control CSOs so that they do not significantly contribute to violations of water quality standards or the impairment of designated uses and to minimize the total loading of pollutants discharged during wet weather. Ohio's Strategy addresses several issues that aren't covered by the national policy (for example, sanitary sewer extensions that occur up pipe of CSOs).

In 2000, Congress passed the Wet Weather Water Quality Act, which did two important things; it codified the 1994 national policy by making it part of the CWA and it required that all actions taken to implement CSO controls be consistent with the provisions of the national policy.

Ohio EPA continues to implement CSO controls through provisions included in NPDES permits and using orders and consent agreements when appropriate. The NPDES permits for Ohio's CSO communities require them to implement the nine minimum control measures. Requirements to develop and implement Long Term Control Plans (LTCPs) are also included where appropriate. In 2007, U.S. EPA adopted a new definition for the Water Safe for Swimming Measure, which sets goals to address the water quality and human health impacts of CSOs. The new definition sets a goal of incorporating an implementation schedule of approved projects into an appropriate enforceable mechanism, including a permit or enforcement order, with specific dates and milestones for 91 percent of the nation's CSO communities by September 2015. As of December 2014, 81 of Ohio's 89 CSO communities met this

definition (91 percent), meeting the U.S. EPA's Safe for Swimming Measure goal.

Compliance and Enforcement Program

DSW staff works closely with the regulated community and local health departments to ensure that surface waters of the state are free of pollution. The regulated community with which DSW staff works includes wastewater facilities, both municipal and industrial and small, unsewered communities experiencing problems with unsanitary conditions.

DSW staff provides technical assistance, conducts inspections of WWTPs, reviews operation reports, oversees land application of biosolids and manure from large concentrated animal feeding operations and investigates complaints regarding malfunctioning WWTPs and violations of Ohio's WQS. DSW strives to ensure that permitted facilities comply with their NPDES permits. DSW also assists small communities with inadequate means of wastewater treatment to seek alternatives to help abate pollution to surface waters of the state.

Under the NPDES program, Ohio EPA regulates discharges of pollutants from municipal and industrial WWTPs and sewer collection systems; as well as, storm water discharges from industrial facilities and municipalities. Ohio EPA enforces environmental laws, per ORC 6111 and the OAC, to protect human health and the environment and, when warranted, will seek civil or criminal enforcement action against violators to control illegal discharges of pollutants to waters of the state.

In cases where Ohio EPA is unable to resolve continuing water quality problems, DSW may recommend that enforcement action be taken. The enforcement and compliance staff works with Ohio EPA attorneys, as well as the Attorney General's Office, to resolve these cases. All final enforcement orders are posted on DSW's website.

Concentrated Animal Feeding Operations

On December 14, 2000, Governor Taft signed a bill that started the process of transferring authority to regulate concentrated animal feeding operations (CAFOs) to the Ohio Department of Agriculture (ODA), which now regulates construction and operation of large concentrated animal feeding facilities under their Permit to Install (PTI) and Permit to Operate (PTO) programs. However, PTI authority for sewage treatment and disposal systems at animal feeding facilities and for animal feeding facilities that discharge to POTWs remains with Ohio EPA.

Ohio EPA also retains authority for implementing the NPDES permit program for animal feeding operations until the revised delegation agreement with U.S. EPA that has been submitted by Ohio is approved by U.S. EPA. As a result of federal rule revisions and court decisions, only facilities that meet the definition of a CAFO and actually discharge to surface waters of the state are required to apply to Ohio EPA for an NPDES permit.

The CAFO program at Ohio EPA uses a watershed perspective to prioritize work to some degree. The changes in the federal rule resulting in CAFO NPDES permits being required only when a facility discharges limits our need and ability to prioritize permitting by watersheds. However, the status of the watershed is considered in making decisions about enforcement and compliance activities (e.g., supplemental environmental projects may be preferred over penalties; more technical assistance may be focused on TMDL watersheds).

Credible Data – Volunteer Monitoring Program

The program's authorizing legislation was passed and signed by the governor in 2003. Ohio EPA adopted rules in 2006 (OAC Chapter 3745-4) for the program's operation and revised those rules in 2011. The legislation and the rules are explicit in the desire to not only encourage the collection of water quality data by volunteers, but also to ensure that the data are valid and useful for their intended purpose. In other words, the data should be "credible." The rule package bears the name "Credible Data" because of this important feature and because the enabling legislation was referred to as the credible data bill. Thus, the words "credible data" appear in the terminology applied to voluntary monitoring programs that choose to participate.

As envisioned by the legislation, any person with an interest in water quality should have a means to collect certain types of data useful for various inquiries about the quality of the water resource. Ohio EPA's role is to foster and broadly oversee the collection, analysis and use of data collected by such "volunteer" individuals and organizations. To promote scientific validity, Ohio EPA has established specific requirements to participate in the program and to collect data using approved study plans.

The law and the administrative regulations are the basis for establishing three broad categories or levels of data that will be deemed "credible" for distinctly different purposes. The overall premise is that there must be an increasing level of scientific rigor behind the sampling and analytical work as we progress from Level 1 to Level 2 to Level 3.

Level 1's purpose is primarily to promote public awareness and education about surface waters of the state. Level 1 may be appropriate for educators from Soil and Water Conservation Districts (SWCDs), Park Districts, Health Departments, schools or anyone with an interest in Ohio water quality.

Level 2 was designed with watershed groups in mind and may also be appropriate for SWCDs and Health Departments. Level 2 data can be used to evaluate the effectiveness of pollution controls, to conduct initial screening of water quality conditions and to promote public awareness and education about surface waters of the state. Level 2 groups are often in the position to perform the valuable function of monitoring long-term surface water quality trends in a watershed (where Ohio EPA may not have the resources to frequently revisit a particular area).

Level 3 provides the highest level of scientific rigor and methods are equivalent to those used by Ohio EPA personnel. The law limits the director's use of data collected under the credible data program for certain regulatory applications (for example, setting water quality standards and evaluating attainment of those standards) to verified Level 3 data. In other words, data submitted under this program as Level 1 and Level 2 data cannot be used for those regulatory purposes.

As of September 2015, the Agency has approved over 1,000 Qualified Data Collectors and 140 study plans. Ohio EPA has created a web-based portal for data entry and data access (Credible Data Online Application, http://www.epa.ohio.gov/dsw/credibledata/submission_of_data.aspx), available through Ohio EPA's eBusiness Center.

Inland Lakes Program

Ohio EPA initiated a renewed monitoring effort for inland lakes in 2008. This report assesses three of the four beneficial uses that apply to inland lakes: recreation, public drinking water supply and human health (via fish tissue). Ohio EPA is in the process of updating the water quality standards rules for lakes. Once these rule updates are complete, Ohio EPA expects to include an assessment of the aquatic life use for

lakes as a factor in listing watershed or large river assessment units in future CWA Section 303(d) lists. More information about Ohio EPA's Inland Lakes Program may be found in Section I of this report.

Lake Erie Program

Ohio EPA's DSW participates in many Lake Erie and Great Lakes related issues and efforts. The key program areas are implementation of Remedial Action Plans (RAPs) under the Areas of Concern Program and implementation of the binational Lake Erie Lake-wide Action and Management Plan (LAMP). Restoration of Areas of Concern (AOCs) and implementation of the Lake Erie LAMP are focused on reducing the loadings of pollutants and restoring all beneficial uses to these waterbodies. Both programs are described in the Great Lakes Water Quality Agreement (GLWQA) between Canada and the United States and are mandated under the Great Lakes Critical Programs Act amendment to the CWA. The GLWQA was most recently revised in 2012 and the Agency is directly involved in implementing the new goals and requirements contained in the agreement.

Ohio EPA also conducts routine monitoring of Lake Erie (within Ohio's jurisdiction) and is responsible for reporting the Lake's condition and identifying impaired waters under the CWA. Ohio EPA initiated a *Comprehensive Lake Erie Nearshore Monitoring Program* in 2011 with the assistance of a Great Lakes Restoration Initiative (GLRI) grant to develop and implement a comprehensive monitoring program. Ohio's long-term monitoring program includes an assessment of water and sediment quality in the western and central basins at fixed ambient stations located in shoreline (bays) and nearshore areas. Biological monitoring includes tracking of burrowing mayfly[1] populations and calculation of fish index scores at select shoreline locations. The hypoxia/anoxia phenomenon in the Central Basin is also monitored with a series of transects that connect fixed ambient stations to the open waters. Periodic intensive surveys in bays, harbors and estuaries are also done.

This monitoring effort supports Annex 2 in the GLWQA, which calls for development of nearshore monitoring to support an integrated nearshore framework. Annex 4 of the GLWQA addresses nutrients and Ohio EPA's monitoring may also support assessment of the lake ecosystem objectives identified in the agreement. Monitoring will directly support the agency's CWA evaluation of the Lake Erie Assessment Units in the bi-annual Integrated Report (IR). Additionally, long-term monitoring will provide the data needed to evaluate water quality trends, assess the effectiveness of remedial and nutrient reduction programs, measure compliance with jurisdictional regulatory programs, identify emerging problems and support AOC delisting.

Initiated in 2012, Ohio EPA expanded monitoring efforts to support the Lake Erie Charter Boat captain monitoring initiative. This unique public-private partnership engaged a key stakeholder that is directly impacted by the recent harmful algal blooms and declining water quality conditions on the lake. Ohio EPA has continued to provide funding to Ohio State University's (OSU) Stone Lab to manage the project and conduct sample analyses from the Charter Boat sampling initiative.

The Lake Erie Program works with many different Division and Agency programs to fulfill current program obligations. Due to the diverse nature of Lake Erie issues there are often activities that fall outside of the three primary components of the program (i.e., AOCs, Monitoring and LAMP) and meaningful engagement with other programs is essential.

[1] As an indicator organism, the status of mayfly populations can be used to evaluate long term changes in water and sediment quality (Krieger et al, 2004).

Areas of Concern (Remedial Action Plans)

Areas of Concern (AOCs) were initially identified in the early 1980s as the most environmentally degraded areas along Ohio's Lake Erie coast. Annex 1 of the GLWQA calls for restoration of beneficial uses that have become impaired due to local conditions at AOCs through development and implementation of RAPs. In many ways these beneficial use impairments (BUIs) reflect the same general goals as represented in the Ohio WQS, but many have targets that differ from the WQS criteria. The BUIs include: 1) restrictions on fish and wildlife consumption; 2) tainting of fish and wildlife flavor; 3) degradation of fish and wildlife populations; 4) fish tumors or other deformities; 5) bird or animal deformities or reproductive problems; 6) degradation of benthos; 7) restrictions on dredging; 8) eutrophication or undesirable algae; 9) restrictions on drinking water or taste and odor problems; 10) beach closings; 11) degradation of aesthetics; 12) added costs to agriculture and industry; 13) degradation of phytoplankton and zooplankton populations; and 14) loss of fish and wildlife habitat.

One way to track progress in AOCs is to measure how close the areas are to achieving restoration (delisting) targets. Restoration targets have been determined for each of the beneficial uses and the monitoring programs needed to evaluate the targets are now being designed and implemented. In 2014, Ohio EPA developed a new AOC Program Framework and updated the "Delisting Guidance and Restoration Targets for Ohio Areas of Concern." The new Framework and Guidance provide clarity for how the state and local AOC Advisory Committees will work together to implement the needed management actions and remove BUIs and delist the AOC. The guidance also assists in tracking progress toward achieving the stated delisting goals under the Great Lakes Regional Collaboration (GLRC) and the associated Great Lakes Initiative Action Plan.

Ohio EPA and our AOC partners have successfully leveraged funding under the GLRI and from other sources to complete assessments and implement effective restoration projects in the state's four AOCs. Figure C-1 displays the AOCs and major tributaries to Lake Erie; a description of each AOC follows.

Ashtabula River AOC

A series of successful dredging projects in 2006-2007 and 2012-2013 under the Great Lakes Legacy Act (GLLA) Program, the GLRI and other recent dredging by the U.S. Army Corps of Engineers (Corps) were critical actions needed to begin removal of BUIs in this AOC. Remediation of the contaminated sediments is necessary to remove BUIs for restrictions on dredging, degradation of benthos, fish tumors and fish consumption restrictions. To address the fish population and habitat related BUIs, Ohio EPA completed a large habitat restoration project on the 5 ½ Slip in 2012 and a sediment and restoration GLLA project in 2014 in the North Slip at Jacks Marine. In 2014 a significant milestone was reached with the completion of all management actions. The river is rapidly rebounding and in April 2014, three BUIs (fish consumption; fish and wildlife populations; and fish and wildlife habitats) were formally removed. There are now only three BUIs remaining in this AOC. Verification monitoring is needed to assess the effects of remediation and restoration activities including evaluation of the benthos community; fish tumors and other deformities; and characterization of current sediment quality. Once monitoring indicates that the river has responded as anticipated and restoration targets have been achieved, the Ashtabula River will be delisted as an AOC.

Black River AOC

There are nine BUIs in this AOC with one (fish tumors) listed as in recovery and two others ready for removal. U.S. EPA funded development of the Lower Black River Ecological Restoration Master Plan in 2009 and numerous restoration projects and characterization studies identified in the plan have been completed. In July 2015, the AOC was formally re-sized to include just the lower portions of the Black

River mainstem watershed and the French Creek watershed (East and West Braches are now excluded). Also in July 2015, U.S. EPA accepted a list from Ohio EPA and the Local Advisory Committee identifying the remaining management actions. Ohio EPA is working with U.S. EPA and the Black River AOC Advisory Committee and local implementers to complete the remaining projects. Progress in this AOC is accelerating and the local AOC Advisory Committee and partners are committed and energized to remove the remaining BUIs within the next few years.

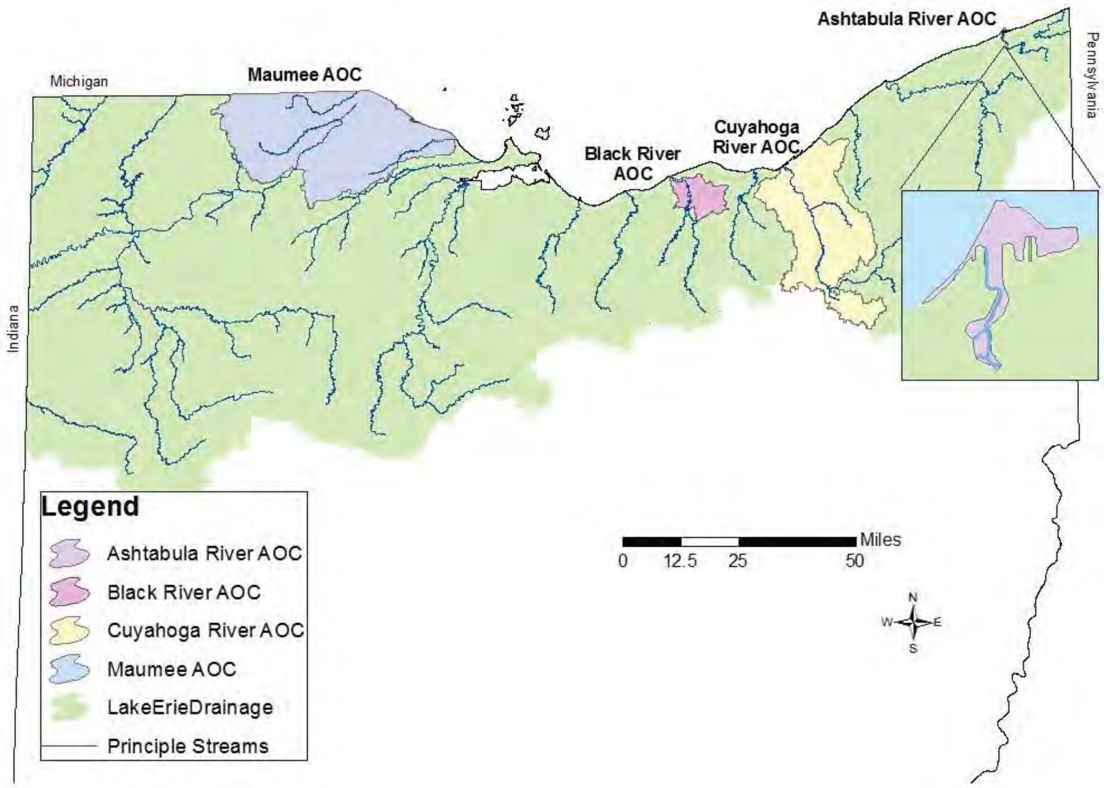


Figure C-1. Ohio Lake Erie AOCs and major Lake Erie tributaries.

Cuyahoga River AOC

There are nine BUIs in the Cuyahoga River AOC. The entire mainstem is achieving delisting targets for biological populations except in the Rt. 82/Brecksville dam pool, the Gorge Dam pool and in the navigation channel. Addressing the contaminated sediments is a top priority and a significant number of actions are currently underway. The final Environmental Impact Statement (EIS) report for the Route 82 Dam should be finalized later in 2016 with dam removal to follow and other projects are underway to improve habitat in the Cuyahoga River navigation channel. GLLA sediment characterizations studies are now final for the Old Channel and Gorge dam sediments and a feasibility study was completed for the Gorge Dam in September 2015 to determine the costs and steps needed to manage the impounded sediment and to remove the dam. The Cleveland Port Authority is developing a plan to address the Old River Channel sediments in 2016. In 2014-2015, Ohio EPA worked with the local facilitating organization to re-establish the Local Advisory Committee. New leadership has been appointed and the committee and sub-committees are formed. Ohio EPA also received a 2014 GLRI grant for strategic implementation planning within the AOC and this project will continue into 2016 and provide a foundation for the habitat restoration plan for the Cuyahoga AOC. Ohio EPA is working with the local AOC group to identify restoration needs, identify priority management actions and implement those projects.

Maumee River AOC
The Maumee AOC is Ohio's largest and most complicated AOC. Contaminated sediments, nonpoint sources, nutrient loads and habitat loss are all major issues. The Maumee River watershed is a major contributor to the impaired water quality of the western basin which is a priority concern under Annex 4 and the Lake Erie LAMP. An important milestone was reached in September 2015 with the removal of the first BUI (BUI12-added costs to agriculture and industry). There are nine BUIs remaining. A GLLA sediment remediation project and Natural Resource Damage Assessment (NRDA) are currently underway on the Ottawa River and other GLLA characterizations on the mainstem are continuing. These assessments are vital in helping Ohio EPA and the local Advisory Committee determine restoration needs and prioritize management actions. In 2014-2015, Ohio EPA worked with the local facilitating organization to re-establish the Local Advisory Committee. New leadership has been appointed and the committee and sub-committees are working to set the path forward. There is a revitalized sense of purpose and focus on delisting and recent assessments of BUI status under the new targets reveal that we are closer to removing several BUIs than previously thought.

Statewide AOC Projects
Ohio EPA revised the 2014 "Delisting Guidance and Restoration Targets for Ohio Areas of Concern." As the Local AOC Advisory Committees implemented the new targets and guidance, a number of corrections and improvements were identified including updating the Black River AOC boundary. The updated guidance (Version 2) was recently finalized in January 2016 and is available online at http://epa.ohio.gov/dsw/lakeerie/index.aspx#125637033-documents.

Lake Erie Lake-wide Action and Management Plan (LAMP, formerly LaMP)
Annex 2 of the GLWQA addresses binational lake-wide management and specifies that the LAMPs for each of the Great Lakes shall document and coordinate the management actions required in the Annex. Specifically, Annex 2 calls for the following management actions:

- establish lake ecosystem objectives;
- assemble, assess and report on existing scientific information;
- identify research, monitor and other priorities to support management actions;
- conduct surveys, inventories, studies and support outreach efforts;
- identify additional action needed to address priority water quality threats;
- develop and implement lake specific binational strategies; and
- by 2015, develop an integrated near shore framework for implementation.

The Lake Erie LAMP also serves as the primary mechanism for coordinating development and implementation of lake-wide habitat and species protection and conservation strategies as required in Annex 7 (Habitat and Species) of the GLWQA. The Lake Erie LAMP was originally intended to focus on reducing loadings of toxic chemical pollutants to the lake but now also includes strategies for addressing NPS pollutants such as nutrient loadings and habitat alterations as well as other issues affecting water quality such as land uses, invasive species and others. The Lake Erie LAMP is a comprehensive framework that outlines the management actions needed to bring Lake Erie back to chemical, physical and biological integrity. Work to restore the AOCs and implement the LAMP program both support the U.S. EPA Strategic Plan objective 2.2 – Protect and Restore Watershed and Aquatic Ecosystems.
Many of the new directives outlined in the 2012 GLWQA will be implemented through the binational LAMP partnership, including the binational nutrient reduction strategy for Lake Erie, the Nearshore monitoring framework and other initiatives. Although the LAMPs are not specifically mentioned in the

GLRC, many of the priorities addressed in the GLRC Strategy report are actions recommended by the LAMP. The Great Lakes Initiative Action Plan more strongly includes the LAMPs and does specifically emphasize the implementation of projects that will address LAMP priorities. It is becoming increasingly evident that local stream water quality targets may not be enough to achieve the restoration and protection of the lake. This requires building a stronger connection between watershed/AOC programs and the lake. Reducing nutrient loads and input from the Maumee River watershed, which have a significant impact on the state of Lake Erie, is a stated priority under the GLRI Action Plan. In fact, the Maumee has been identified as a priority watershed in the most recent GLRI Action Plan.

NPS and beach health issues listed in the GLRC and the GLRI plans are important issues for both the AOCs and the Lake Erie LAMP. Programs such as the CWA Section 319, the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000, CSO Long-term Control Plans, NRCS-supported agricultural BMP programs and many others are existing efforts that RAP and LAMP partners must coordinate with to expedite restoration. Since January 2014, Ohio EPA’s Lake Erie program has been managed alongside the NPS program, which has strengthened coordination between the two programs.

For both the AOCs and the LAMP, it is imperative to keep the local communities and stakeholders engaged. In Ohio’s AOCs, the local communities and partners have played a significant role in obtaining the resources for implementation, providing matching funds and serving as the local sponsor. A reliable, long-term source of funding is essential to continue to fund the administration and outreach costs associated with local coordinator leadership efforts. Public outreach efforts are also needed to better connect the decisions and projects in the watersheds to the environmental condition of the lake.

National Pollutant Discharge Elimination System (NPDES) Permits

To protect Ohio's water resources, Ohio EPA issues NPDES permits. These permits authorize the discharge of substances at levels that meet the more stringent of technology or water quality based effluent limits and establish other conditions related to issues such as CSOs, pretreatment and sludge disposal. This is an overview of the process for issuing individual NPDES permits. The series of steps for a particular permit may vary somewhat depending on the size, nature and complexity of the discharge.

The first step in developing an NPDES permit is acquisition of chemical, physical and biological data from the field and laboratory. In-stream chemical data are collected to determine the effect of the discharge on receiving water and sediment quality. Biological data are collected to determine if the discharge is having an impact on the fish and macroinvertebrate organisms that live in the receiving water. Effluent chemical data are also obtained to establish an accurate portrayal of current discharge conditions. In-stream chemical data and stream physical data, such as cross section measurements and flow, are necessary for conducting water quality modeling.

As part of developing effluent limits and monitoring requirements, the water quality standards that apply to the receiving water are determined and federal effluent guidelines are consulted for applicability. Permit conditions are developed to protect the designated use and associated chemical criteria of the receiving stream as well as any applicable technology requirements. Permits are also based on the applicable regulatory requirements to address issues such as new or expanded discharges, CSOs, sludge disposal and industrial pretreatment programs.

In places where a TMDL is in place, or under development, permit limits will also be developed to ensure they do not conflict with the TMDL. Permits may include schedules of compliance to meet the TMDL based limits. Permit writers are included on the TMDL teams and work with permittees and the TMDL

team on permit language necessary to implement the TMDL. This helps ensure there are no gaps between the TMDL results and the permit limits that are imposed.

Nonpoint Source (NPS) Program

The framework for Ohio's NPS Program is provided in Ohio's "Nonpoint Source Management Plan." The updated NPS Management Plan, which outlines strategies and objectives for Ohio's NPS program through 2018, was forwarded to U.S. EPA Region 5 on December 31, 2013. The updated plan includes a description of Ohio's NPS grant funding sources which include: Section 319(h) grants and Ohio's Surface Water Improvement Fund (SWIF). The NPS Management Plan (NSMP) also includes a listing of state, federal and local partners—those on whom we rely to best implement the strategies outlined in the updated plan.

The NSMP plan provides four sections where one can easily understand the strategic vision along with aggressive (yet reasonable) goals and objectives of Ohio's NPS Program over the next five years. These sections include:

1. Urban Sediment and Nutrient Reduction Strategies—including recommended practices
2. Altered Stream and Habitat Restoration Strategies—including recommended practices
3. NPS Reduction Strategies—including practices and management actions to reduce silt, sediment and nutrient losses from agricultural lands
4. High Quality Waters Protection Strategies

Ohio's NPS Program currently is administering various GLRI grants, including:

- The Lake Erie Nutrient Reduction Demonstration Project – Loss Creek, Sandusky River watershed (Crawford County, Ohio), which expanded into Brandywine/Broken Sword watershed and focuses on agricultural conservation and storm water runoff;
- The Lake Erie Watersheds Nutrient Reduction Project, Phase 2 – Loss Creek, Brandywine/Broken Sword Creeks, Indian Run-Broken Sword Creek, Headwaters Sycamore Creek and Greasy Run-Sycamore Creek watersheds (Crawford County, Ohio) with focus on agricultural conservation projects;
- Lye Creek, Blanchard River watershed (Hancock County, Ohio), which has expanded into Eagle Creek watershed and focuses on agricultural conservation practices, riparian restoration and storm water demonstration projects;
- Powell Creek, Auglaize River watershed (Defiance and Putnam counties, Ohio), which focuses primarily on agricultural conservation practices and some home sewage treatment system work; and
- Maumee River Sediment and Nutrient Reduction Initiative, which includes eight unique subgrants in locations throughout the Maumee watershed in Ohio for projects such as stream restoration, wetland restoration, riparian restoration, an innovative agricultural runoff and reuse project, an innovative channel and drainage water management project and urban storm water bio-retention.

Ohio's NPS Program has recently wrapped up Cuyahoga County and Lucas County (county-specific) Storm water Demonstration grants, where matching SWIF dollars helped to leverage approximately 22 projects in the past several years.

Ohio's NPS program also oversees several other important programs and initiatives. The Ohio Inland

Lakes program is designed to access, evaluate and protect or restore Ohio's inland lakes. The updated NPS Management Plan includes five-year goals and objectives for the Inland Lakes Program. The Ohio NPS program oversees the Healthy Waters Initiative, which implements activities based upon the findings of TMDL reports and action items provided in endorsed watershed action plans. The Ohio NPS program oversees the Ohio Watershed Program. Fifteen years after it was established, the Ohio Watershed Program is in a state of transition. Ohio's Watershed Program is now much more focused on implementing practices identified in TMDLs and endorsed watershed action plans and tracking progress.

Ohio's NPS program is now also overseeing Ohio's Lake Erie Program. This program tracks implementation of RAPs on Lake Erie tributaries designated as "Areas of Concern," supports Lake Erie shoreline monitoring and participates in the development and implementation of the LAMP, a document that outlines and helps coordinate management actions to protect and restore Lake Erie. The updated NPS Management Plan includes five-year goals and objectives for Ohio's Lake Erie Program. The most current version of Ohio's NPS Management Plan is available at: http://www.epa.ohio.gov/Portals/35/nps/NPS_Mgmt_Plan.pdf.

Most of Ohio's population is located in urban areas and, likewise, are located near major rivers that are impacted by hydromodification, riparian corridor losses and inputs from storm sewer. Ohio's NPS Program is committed to partner with communities; to provide leadership and funding for communities; and to use a well-defined hierarchy that prioritizes projects, so that high magnitude causes of impairment are eliminated and impaired streams segments in urban areas are incrementally restored.

Progress toward achievement of Ohio's Section 319(h) grants program goals will continue to be measured as part of Ohio's NPS Monitoring and Assessment Initiative. For the past eight years, Ohio EPA staff has conducted all monitoring (physical, chemical and biological), beginning with baseline monitoring through project completion to determine the effectiveness of Section 319 (h) and SWIF funded NPS projects. This initiative not only provides cost savings and improved data quality, but also relieves grant recipients of a task which was often difficult for them to do properly. This initiative also serves as a very important environmental measure: are NPS-funded projects improving water quality or not?

Pretreatment

The State of Ohio received authorization to administer the Pretreatment Program on July 27, 1983. Ohio EPA has approved 126 municipal pretreatment programs and continues to provide pretreatment training and guidance. Many of these programs, such as Cincinnati's Metropolitan Sewer District and Cleveland's Northeast Ohio Regional Sewer District, are national leaders and are regarded as very strong pretreatment programs.

A goal of Ohio EPA's Pretreatment Program is to permit 100 percent of significant industrial users (SIUs) with control mechanisms to implement applicable pretreatment standards and requirements. Ohio EPA's permit framework is designed to ensure that all SIUs within the state, regardless of the POTW's pretreatment program approval status, are issued permits. Those SIUs in approved pretreatment program POTWs are identified by industrial user surveys. As of June 2015, there are 1,274 SIUs discharging to POTWs with approved programs and 133 (known) SIUs that discharge into pretreatment POTWs without approved pretreatment programs have control mechanisms for a total of 1,407 known SIUs in Ohio.

A highlight of Ohio's pretreatment program is the strong indirect discharge permit (IDP) program. The IDP program permits, monitors, inspects and provides enforcement to the SIUs that discharge into pretreatment POTWs without approved pretreatment programs. By this program, Ohio EPA prevents toxic discharges to these smaller POTWs and thereby reduces the potential of severe environmental harm from these facilities.

Section 208 Plans and State Water Quality Management Plan

Ohio EPA oversees the State Water Quality Management (WQM) Plan. The State WQM plan is a requirement of CWA Section 303 and must include nine discrete elements:

1. TMDLs
2. Effluent limits
3. Municipal and industrial waste treatment
4. NPS management and control
5. Management agencies
6. Implementation measures
7. Dredge and fill program
8. Basin plans
9. Ground water

The State WQM plan is an encyclopedia of information used to plot and direct actions that abate pollution and preserve clean water. A wide variety of issues is addressed and framed within the context of applicable laws and regulations. For some issues and locales, information about local communities may be covered in the plan. Other issues are covered only at a statewide level. Many of the topics or issues overlap with planning requirements of CWA Section 208 (items 3-9 above). The State WQM plan includes, through references to separate documents, all 208 plans in the State.

Local governments typically conduct planning to meet the sewage disposal needs of the community. Ohio EPA has established guidelines for planning that are useful in the context of Section 208 and the State WQM plan. Local governments that follow these guidelines are more likely to have the results of their planning work incorporated into the State 208 plan prepared by Ohio EPA. The Areawide Planning Agencies have established their own operating protocols, committees and processes to involve local governments in shaping their 208 plans.

Under Section 208 of the federal CWA, States may designate regional planning agencies to prepare, maintain and implement water quality management plans. All six Areawide Planning Agencies were able to update their 208 plans in 2011, because of increased funding through the American Recovery and Reinvestment Act of 2009 (ARRA) and the State's biennium budget. Additional updates occur on an ongoing basis. The most recent 208 Plan amendments were approved by U.S. EPA on April 8, 2016.

Section 401 Water Quality Certifications

The CWA requires anyone who wishes to discharge dredged or fill material into the waters of the United States, regardless of whether on private or public property, to obtain a CWA Section 404 permit from the Corps and a CWA Section 401 Water Quality Certification (WQC) from the state. Ohio EPA is responsible for administering the CWA Section 401 WQC process in Ohio.

Rules governing the 401 review process are currently found in OAC 3745-1-05 (Stream Antidegradation), 3745-1-50 through 54 (Wetland Water Quality Standards) and 3745-32-01 through 7 (Section 401 WQCs).

Under Ohio's Antidegradation Review, the director may authorize the lowering of water quality resulting from the discharge of dredged or fill material only after determining that the lowering of water quality will not result in the violation of state water quality standards. This is achieved through 1) conducting an alternatives analysis; 2) intergovernmental coordination with other state and federal resource agencies; and 3) a public involvement process.

Applicants must develop three alternatives for each development: preferred, minimal degradation and non-degradation alternatives. The alternatives analysis is intended to walk applicants through a deliberate process to avoid and minimize impacts to aquatic resources while still achieving the project's purpose and need. Applicants must provide compensatory mitigation for any unavoidable impacts to streams and/or wetlands. The program emphasizes evaluation of physical habitat and bio-criteria to determine potential impacts to water quality and to evaluate potential mitigation sites.

Ohio EPA strongly encourages applicants to engage in pre-application coordination early in the development phase to help identify high quality resources, discuss potential alternatives and identify mitigation obligations. Under state law, the 401 application must contain 10 specific items in order for the technical review to begin. When the application is formally considered complete, Ohio EPA has 180 days to conduct its technical review and either approve or deny the project. An applicant may withdraw the application. All projects are subject to minimum 30-day public comment period. Controversial projects may also require a public hearing.

Nationwide permits (NWPs) are general permits issued by the Corps for certain types of projects that are similar in nature and cause minimal degradation to surface waters of the State. There are currently 49 NWPs. Ohio EPA certified many of the NWPs on March 30, 2012, and April 19, 2012 (subject to conditions). The NWPs must be renewed every five years.

401 staff are assigned a specific region of the state based on Ohio EPA districts. In addition, Ohio EPA has staff dedicated specifically to the review of coal mining and Ohio Department of Transportation (ODOT) projects, as well as the review of stream and wetland mitigation project compliance. Additional staff is dedicated to wetland research in support of the 401 WQC program.

Semi-Public Disposal System Inspection Contracts (HB 110)

Annually, Ohio EPA issues hundreds of permits for the installation and operation of small, commercial/industrial wastewater treatment and/or disposal systems. These may be onsite soil dissipation systems or discharging systems under the NPDES permit program for the treatment and disposal of sewage generated within the operation. To date, there are thousands of these small systems operating in Ohio. These "semi-public" systems may include apartment complexes, small businesses, industrial parks, etc. and, by definition, are basically any system that treats sewage from human activities up to a capacity of 25,000 gallons per day. Because of the magnitude and resources available, many of these systems have the potential of going without regular inspections to determine if they are complying with state rules, laws and regulations and ultimately protecting water quality.

As an aid to support this program, the Ohio General Assembly created Ohio EPA's HB110 Program. The program is a contractual partnership between local health districts and Ohio EPA, whereby local health districts (LHDs) conduct, on behalf of the Agency, inspection and enforcement services for commercial sanitary waste treatment/disposal systems discharging between 0-25,000 gallons per day (semi-publics).

Ohio EPA operates the HB110 Program to better protect the public health and welfare and to protect

the environment. Ohio EPA believes that because of the proximity, the multitude of facilities, and the availability of resources, oversight of operations for sanitary waste disposal at semi-publics may best be accomplished locally by qualified personnel.

To offset costs of local oversight, State law (ORC 3709.085) authorizes LHDs to charge fees for inspection services to be paid by semi-publics.

Inspection Program
In accordance with Ohio EPA's HB110 contracts, LHDs regularly inspect sanitary facilities at semi-publics for compliance with Ohio's water pollution control laws and regulations. Investigations of complaints regarding waste disposal by semi-publics are also accomplished locally.

Ohio EPA also consults with LHDs on the approval of plans and issuance of PTIs for semi-publics. Installation inspections may be performed locally to ensure compliance with Ohio EPA's PTI conditions.

Enforcement Activities
In coordination with Ohio EPA, LHDs may notify entities of noncompliance with Ohio's water pollution control regulations. LHDs are also instrumental in identifying semi-publics installed without PTIs, of which Ohio EPA may not be aware.

Where noncompliance notification and informal requests fail to correct violations, entities may be referred to Ohio EPA for enforcement or the County Prosecutor may bring an action under local nuisance ordinances. All discharges of pollutants in a location where they cause pollution of waters of the state that are unpermitted or in excess of permitted amounts are statutory nuisances under Revised Code 6111.04.

Training Program
Ohio EPA intends to provide periodic training for LHDs. Training programs will focus on sanitary waste disposal for Semi-Public facilities, technical assistance, inspection issues and enforcement case development.

Summary
The HB110 Program is a unique opportunity for Ohio EPA and LHDs to assist one another in achieving the mutual goal of protecting public health and welfare. Through responsible regulation of Semi-Public facilities, the local community will benefit from decreased health risks and the State as a whole will benefit from improvements in water quality. Ohio EPA welcomes the participation of all LHDs.

Storm Water Permit Program
Ohio EPA implements the federal regulations for storm water dischargers. Dischargers currently covered include certain municipalities (Phases I and II of the program) with separate storm sewer systems (MS4s) and those facilities that meet the definition of industrial activity, including construction, in the federal regulations.

In 1992, Ohio EPA issued two NPDES general storm water permits: one for construction activity and the other for all remaining categories of industrial activity. The strategy was to permit the majority of storm water dischargers with these baseline general permits (33 USC Section 1342; OAC Chapter 3745-38). It is estimated that over 38,000 storm water discharges have been granted general permit coverage since that time.

The industrial permit has been renewed four times. The construction permit was renewed in April 2013, for the third time and addresses large and small constructions sites. The application form is one-page and called a Notice of Intent (NOI). Ohio EPA responds to NOIs with approval letters for coverage under one of the general permits or, in limited instances, instructions to apply for an individual permit.

After the baseline general permits were issued, Ohio EPA directed its efforts towards further permitting, compliance and enforcement activities, education and technical assistance. Inspections and complaint investigations for compliance and enforcement have been handled at the district level as resources allow. BMPs and pollution prevention has been the major thrust of education and technical assistance activities.

On the municipal side of permitting, five large and medium municipalities in Ohio submitted applications between November 1991 and November 1993. A work group was formed with the cities to draft acceptable permit language for the municipal permits. BMPs included in a citywide storm water management plan were the primary focus of the permits. The cities of Dayton, Toledo and Akron received their original permits in 1997. Exceptions for Cleveland and Cincinnati were also processed[2]. Columbus received its initial permit in 2000. Permits for Columbus, Toledo and Akron have been renewed twice. Dayton's permit has been renewed three times.

Additional categories of discharges, both public and privately owned, were included in Phase II. U.S. EPA issued Phase II regulations in December of 1999. The Phase II storm water regulations required a general permit for small MS4s be issued by December of 2002 and required applications by March of 2003. Ohio EPA issued two general permits for small MS4s during 2002. One is a baseline permit and the second is for MS4s in rapidly developing watersheds. This latter permit accelerated construction and post-construction measures to protect surface waters from the impacts of high density land use development. Federal regulations allowed small MS4s to apply for individual NPDES permits in lieu of general permit coverage. No small MS4 within Ohio chose the individual permit option. The third generation of the Small MS4 general permit was renewed on September 11, 2014.

On the construction side of permitting, Ohio EPA has begun to develop and issue watershed specific construction permits if recommended by a TMDL. On September 12, 2006, Ohio EPA issued a watershed specific construction permit for the Big Darby Creek watershed and this permit was renewed on October 1, 2012. On January 23, 2009, Ohio EPA issued a watershed specific construction permit for portions of the Olentangy River watershed and this permit was renewed on June 2, 2014. These permits contain conditions/requirements that differ from the standard construction permit and each other. Ohio EPA anticipates developing additional watershed specific permits when recommended by TMDLs.

Total Maximum Daily Load (TMDL) Program

The TMDL program identifies and restores polluted waters. TMDLs can be viewed simply as problem solving: investigate the problem, decide on a solution, implement the solution and check back to make

[2] Phase I federal storm water regulations required permit coverage for municipal separate storm sewer systems (MS4s), which had a MS4 service population of 100,000 or more to obtain NPDES permits. Cleveland and Cincinnati were able to demonstrate that their MS4 service population was less than 100,000 people due to large areas of these cities being served by combined sewers. These two cities were permitted under Phase II of the small MS4 general permit in March 2003. Cleveland and Cincinnati currently have coverage under the third generation Small MS4 general permit.

sure the solution worked. By integrating programs and aligning resources, Ohio is pursuing TMDLs as a powerful tool to develop watershed-specific prescriptions to improve impaired waters.

Ohio uses three key enhancements to the basic federal TMDL requirements to increase the chances that real, measurable improvements in Ohio's water resources will result:

- an initial, in-depth watershed assessment to obtain recent data for analysis of problems and discussion of alternatives;
- implementation actions identified as part of the TMDL with follow-through in permitting and incentive programs such as 319 and loan funds; and
- involving others – citizens, landowners, officials, natural resource professionals – in the process.

In particular, involving others is critical to restoring waters. Working watershed by watershed, Ohio EPA meets with citizens and landowners to explain the findings of our water quality studies and to identify workable solutions to the problems Ohio EPA has found. Ohio EPA includes other agencies that can improve water resources either by exercising their authority in new ways or through relationships they have already established with critical decision makers. After solutions are identified and recommendations are made, Ohio EPA follows through with meetings with consultants, elected officials and others to ensure that projects continue to completion.

Recent Developments in the TMDL Program
On March 24, 2015, the Supreme Court of Ohio determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act. Ohio EPA must follow the rulemaking procedure in R.C. Chapter 119 before submitting a TMDL to U.S. EPA for its approval and before the TMDL may be implemented in an NPDES permit" (*Fairfield Cty. Bd. of Commrs. v. Nally,* 143 Ohio St.3d 93, 2015-Ohio-991 available online at http://www.supremecourt.ohio.gov/rod/docs/pdf/0/2015/2015-Ohio-991.pdf).

Prior to the ruling, TMDLs had been approved by U.S. EPA in approximately 75 percent of Ohio's WAUs, as shown in the "Ohio TMDL Program Progress" map in Section K of this report. By the end of 2015, more than 60 TMDL projects had been approved by U.S. EPA and nearly 40 others are currently being developed. Because none of Ohio EPA's TMDLs have been adopted as rules under Chapter 119 of the Revised Code, the effect of the Supreme Court's ruling is arguably invalidation of all the previously approved TMDLs[3] and requires the development of a new process for finalizing any future TMDLs. Ohio EPA is evaluating alternatives for addressing both past and future TMDLs and expects to have a process in place before the next IR is released.

All of the TMDLs are available on Ohio EPA's website at http://www.epa.ohio.gov/dsw/tmdl/index.aspx.

Water Quality Standards (WQS) Program
Ohio's water quality is constantly threatened by many different sources and types of pollution. Under the CWA, every state must adopt water quality standards to protect, maintain and improve the quality of the nation's surface waters. These standards represent a level of water quality that will support the goal of "swimmable/fishable" waters. Water quality standards are ambient standards as opposed to

[3] The approved projects included two federal TMDLs completed by U.S. EPA Region 5: Wabash River (05120101 101 and 040) and Mahoning River (05030103 050 and 080). Those TMDLs were not impacted by the Supreme Court decision.

discharge-type standards. These ambient standards, through a process of back calculation procedures known as TMDLs or wasteload allocations (WLA) form the basis of water quality- based permit limitations that regulate the discharge of pollutants into surface waters of the state under the NPDES permit program. The key components of Ohio's WQS (OAC Chapter 3745-1) are described below.

Beneficial use designations describe existing or potential uses of water bodies. They take into consideration the use and value of water for public water supplies, protection and propagation of aquatic life, recreation in and on the water, agricultural, industrial and other purposes. Ohio EPA assigns beneficial use designations to water bodies in the state. There may be more than one use designation assigned to a water body. Examples of beneficial use designations include: public water supply, primary contact recreation and aquatic life uses (warmwater habitat, exceptional warmwater habitat, etc.).

Numeric criteria are estimations of concentrations of chemicals and degree of aquatic life toxicity allowable in a water body without adversely impacting its beneficial uses. Although numeric criteria are applied to water bodies, they primarily are used to regulate dischargers through NPDES permits. To ensure protection of those beneficial uses, Ohio EPA determines maximum acceptable concentrations for over 100 chemicals.

Narrative criteria are general water quality criteria that apply to all surface waters. These criteria state that all waters shall be free from sludge, floating debris, oil and scum, color and odor producing materials, substances that are harmful to human, animal or aquatic life and nutrients in concentrations that may cause algal blooms. Much of Ohio EPA's present strategy regarding water quality based permitting is based upon the narrative free from, "no toxics in toxic amounts." Ohio EPA developed its strategy based on an evaluation of the potential for significant toxic impacts within the receiving waters. Other components of this evaluation are the biological survey program and the biological criteria used to judge aquatic life use attainment.

Biological criteria are based on aquatic community characteristics that are measured both structurally and functionally. These criteria are used to evaluate the attainment of aquatic life uses. The data collected in these assessments are used to characterize aquatic life impairment and to help diagnose the cause of this impairment. The principal biological evaluation tools used by Ohio EPA are the Index of Biotic Integrity (IBI), the Modified Index of well-being (MIwb) and the Invertebrate Community Index (ICI). These three indices are based on species richness, trophic composition, diversity, presence of pollution-tolerant individuals or species, abundance of biomass and the presence of diseased or abnormal organisms. The IBI and the MIwb apply to fish; the ICI applies to macroinvertebrates. Ohio EPA uses the results of sampling reference sites to set minimum criteria index scores for use designations in water quality standards.

Antidegradation policy aims to keep clean waters cleaner than the applicable chemical criteria set by the standards wherever possible. The policy is adopted in rule (OAC 3745-1-05) and describes the conditions under which lowering water quality may be authorized under a discharge permit from Ohio EPA. Existing beneficial uses must be maintained and protected. Water quality better than that needed to protect existing beneficial uses must be maintained unless lower quality is deemed necessary to allow important economic or social development (existing beneficial uses must still be protected).

Public participation is mandated and encouraged in all administrative rule makings including the WQS. Any interested individuals are afforded an opportunity to participate in the process of developing water quality standards. Ohio EPA reviews and, as appropriate, revises water quality standards at least once

every three years. When water quality standards revisions are proposed, the public is notified of these revisions. A public hearing is held to gather input and comments.

Wetland Bioassessment Program

Numerous grants from U.S. EPA over many years have funded work that is advancing the science of wetland assessment methodologies in Ohio. Published work includes an amphibian index of biotic integrity (AmphIBI) for wetlands, a vegetation index of biotic integrity (VIBI) for wetlands and a comparison of natural and mitigation (constructed) wetlands. More recently, reports on an assessment analysis of the association between streams and wetland condition and functions in the Big Run Scioto River watershed, incorporating wetland information with data from other surface water resources to develop a TMDL analysis of a central Ohio watershed and the development of a GIS tool to identify potential vernal pool habitat restoration areas have been made available on DSW's web page: http://www.epa.ohio.gov/dsw/401/ecology.aspx.

DSW recently finalized a report from a U.S. EPA grant to assess the ecological condition of 50 randomly selected natural wetlands across Ohio to generate a "scorecard" of wetland condition. This grant "intensifies" data collected as part of U.S. EPA's National Wetland Condition Assessment conducted across the United States in 2011. Also in progress is a detailed study to improve mitigation success in Ohio, which will include a publicly-accessible GIS website for selecting sites with a high likelihood of achieving ecological success; the creation of a simple soil health assessment tool to better identify sites that may require remediation due to historical soil disturbances; and a survey of reference condition riparian habitats to develop specific ecological performance goals for riparian vegetation restoration projects.

DSW has also recently streamlined its VIBI procedure to simplify data collection, analysis and interpretation, with the goal of enhancing the utility of this assessment as a monitoring tool for wetland restoration projects. The modified procedure, called the VIBI-Floristic Quality (VIBI-FQ), is beginning to be used to monitor compensatory mitigation, 319 grants and contaminated clean-up sites, which have required the establishment of wetland habitat. The initial results have been extremely encouraging.

Wetland Protection Program

Ohio's Wetland Water Quality Standards (OAC 3745-1-50 to -54) contain definitions, beneficial use designations, narrative criteria and antidegradation provisions that guide Ohio EPA's review of projects in which applicants are seeking authorization to discharge dredged or fill material into wetlands. OAC 3745-1-53 gives all wetlands the "wetland" designated beneficial aquatic life use. However, wetlands are further defined as Category 1, 2 or 3 based on the wetland's relative functions and values, sensitivity to disturbance, rarity and potential to be adequately compensated for by wetland mitigation.

Category 1, 2 and 3 wetlands demonstrate minimal, moderate and superior wetland functions, respectively. Category 1 wetlands are typified by low species diversity, a predominance of non-native species, no significant habitat or wildlife use and limited potential to achieve beneficial wetland functions. Category 2 wetlands may be typified by wetlands dominated by native species but generally without the presence of, or habitat for, rare, threatened or endangered species, as well as wetlands that are degraded but have a reasonable potential for reestablishing lost wetland functions. Category 3 wetlands typically possess high levels of diversity, a high proportion of native species, high functional values and may contain the presence of, or habitat for rare, threatened and endangered species. Wetlands that are scarce, either regionally or statewide, form a subcategory of Category 3 wetlands for which, when allowable, only short-term disturbances may be authorized.

The rigor of the antidegradation review conducted under OAC 3745-1-50 through -54 is based on the category of the wetland(s) proposed to be impacted. Category 1 wetlands are classified as Limited Quality Waters and may be impacted after examining avoidance and minimization measures and determining that no significant impacts to water quality will result from the impacts. Category 2 and 3 wetlands are classified as General High Quality Waters and may be impacted only after a formal examination of alternatives and a determination that the lowering of water quality is necessary to accommodate social and economic development. In addition, an applicant must demonstrate that "public need" is achieved in order to receive authorization to impact Category 3 wetlands. Compensatory mitigation ratios are based on wetland category, vegetation class and proximity of the mitigation to the impact site.

C2. Program Summary – Environmental and Financial Assistance

The Division of Environmental and Financial Assistance (DEFA) provides incentive financing; supports the development of effective projects; and encourages environmentally proactive behaviors through two main programs: the Ohio Water Pollution Control Loan Fund (WPCLF) and the Water Supply Revolving Loan Account (WSRLA).

Water Pollution Control Loan Fund

In calendar year 2014, the WPCLF financed a number of municipal wastewater treatment needs, as well as NPS pollution control needs, as enumerated below. Through this program, $358,978,319 in financing was provided for 103 projects, of which 90 projects were for municipal point sources and 13 projects assisted NPS controls.

The WPCLF financed implementation of 90 municipal wastewater treatment projects costing $346,119,366. These projects directly addressed sources of impairment for Ohio water resources. 36 of these 90 loans (totaling $54,962,701) were made to communities with a service population of fewer than 5,000 people.

During calendar year 2014, a total of $12,858,953 was awarded for 13 NPS pollution control projects. The Water Resource Restoration Sponsor Program (WRRSP) financed seven projects for $12,522,953 to protect and restore stream and wetland aquatic habitats. Additionally, the WPCLF awarded six direct (principal forgiveness) loans totaling $336,000 for the correction of failing home sewage treatment systems to economically distressed individuals.

Water Supply Revolving Loan Account

The Water Supply Revolving Loan Account focuses on drinking water supplies. In SFY 2014, the fund made 40 loans totaling $47,816,507, which included $17,007,955 to economically disadvantaged communities.

C3. Program Summary – Drinking and Ground Waters

The mission of Ohio EPA's Division of Drinking and Ground Waters (DDAGW) is to "protect human health by characterizing and protecting ground water quality and ensuring that Ohio's public water systems provide adequate supplies of safe water." The division has several programs in place to achieve this mission.

Drinking Water Program
Every Ohioan relies on a safe source of drinking water. DDAGW's Drinking Water Program has jurisdiction over 5,000 public water systems that are required to ensure a safe and adequate supply of drinking water to over 11 million Ohioans.

The Drinking Water Program's functions include overseeing the design and construction of drinking water treatment facilities through plan approval; conducting sanitary survey inspections; administering an operator certification program and a drinking water revolving loan fund; managing compliance monitoring for bacteriological and chemical contaminants; working with public water systems to implement corrective actions when significant deficiencies are identified; developing state rules and guidance for implementing new federal drinking water regulations; and sharing public water system information with the public on the division's web site. Significant interdivision and interagency efforts are being expended to assist public water systems and implement Ohio's Public Water System Harmful Algal Bloom Response Strategy. In 2016, a new section was created in DDAGW to manage and implement both the public water system and recreational HAB response.

Ground Water Program
DDAGW's Ground Water Program maintains a statewide ambient ground water quality monitoring program; shares ground water quality data on the division web site; conducts ground water quality investigations; provides technical support to other Ohio EPA programs by providing technical expertise on local hydrogeology and ground water quality; and protects ground water resources through the regulation of waste fluid disposal in its Underground Injection Program for Class I, IV and V wells.

Source Water Protection Program
Several programs are in place or are being implemented to help protect Ohio's water resources. The Source Water Assessment and Protection Program protects aquifers and surface water bodies that are used by public water systems. A public water supply beneficial use assessment methodology has been developed in conjunction with DSW and it is being implemented.

C4. Program Summary – Environmental Services

For Ohio EPA to protect public health and the environment, Agency staff depends on scientific data to make well-informed decisions. The Division of Environmental Services (DES), Ohio EPA's laboratory, provides most of this data. DES analyzes environmental samples for more than 300 parameters. The laboratory provides chemical and microbiological analyses of drinking, surface and ground water; wastewater effluent; sediment; soil; sludge; manure; air filters and air canisters; and fish tissue.

DES processes approximately 10,000 samples annually, generating approximately 139,500 inorganic and 91,000 organic data points. DES also is responsible for administrating U.S EPA's Discharge Monitoring Report-Quality Assurance Study Program, inspects drinking water and wastewater laboratories and provides technical assistance to Ohio EPA divisions as well as state and local agencies.

C5. Cooperation among State Agencies and Departments

Ohio Water Resources Council
The Ohio Water Resources Council (OWRC), established in statute in 2001, is a forum for policy development, collaboration and coordination for one of Ohio's most important natural resources –

water. The OWRC membership is comprised of an Executive Assistant to the Governor and the directors of the following nine state agencies and commissions:

- Ohio Environmental Protection Agency
- Ohio Department of Natural Resources
- Ohio Department of Health
- Ohio Water Development Authority
- Ohio Public Works Commission
- Ohio Department of Transportation
- Public Utilities Commission of Ohio
- Ohio Department of Agriculture
- Ohio Department of Development

Members of the OWRC meet regularly to work on initiatives and projects that will advance Ohio's strategic goals for water resource management. Two groups assist the OWRC in pursuing its goals. The State Agency Coordinating Group, consisting of staff from the member agencies and the executive director of the Ohio Lake Erie Commission, serves Council members in support and research roles. The Advisory Group, including 20 members appointed by the OWRC and eight technical members representing a variety of stakeholder groups, advise the Council and participate in work groups to develop recommendations on water resource issues. Additional information is available online at http://epa.ohio.gov/dsw/owrc.aspx.

The continued collection of long-term water resources data, effective management of the data and easy access to data and information have been identified as a strategic issue in the OWRC Strategic Action Plan for many years. In 2012, the State Agency Coordinating Group created the Water Quality Monitoring Steering Committee – a small, action oriented group charged with enhancing the effectiveness and use of surface and ground water quality data collected in Ohio. The Committee is composed of ground water and surface water technical or management staff from five state agencies (Agriculture, Health, Natural Resources, Transportation and Environmental Protection) and USGS. Ohio EPA's DSW is the designated lead for the committee.

The first priority identified, and being actively pursued, is to better share and disseminate surface water quality data collected by state agencies. A pilot project with ODNR's Divisions of Oil and Gas and Mineral Resources is underway that would enable sending their surface water quality data to U.S. EPA's STORET database so it would be available through a federally maintained web portal. Once that is accomplished, other Divisions of ODNR (e.g. Wildlife) may be approached to continue this effort. Future plans include developing similar protocols for groundwater data and compliance data and eventually branching out to other significant water quality and quantity data collectors in the state.

Ohio Lake Erie Commission

The Ohio Lake Erie Commission is comprised of the directors of Ohio EPA and the Ohio departments of natural resources, transportation, development, health and agriculture and up to five additional members appointed by the governor. The role of the Commission is to preserve Lake Erie's natural resources, to protect the quality of its waters and ecosystem and to promote economic development of the region. The Commission administers Ohio's Lake Erie Protection Fund, which was established to finance research and implementation projects aimed at protecting, preserving and restoring Lake Erie and its watershed. Since its inception in 1993, the Commission has awarded over 12 million dollars for projects that focus on an array of issues critical to the effective management of Lake Erie and further

the goals of the *Lake Erie Protection and Restoration Plan*. The Fund is supported through tax-deductible donation or purchase of a Lake Erie license plate, which displays the Marblehead Lighthouse or the Lake Erie life preserver. Additional information is available online at http://lakeerie.ohio.gov/.

C6. Funding Sources for Pollution Controls

It is beyond the means of this report to place a dollar value on the environmental improvements gained to date. However, Ohio EPA has documented the recovery of numerous major river segments including the Cuyahoga River, Licking River, Paint Creek and Scioto River. The most successful restoration efforts in Ohio have been those that have combined one or more funding sources to reach water resource goals. Different funding sources are directed towards many different facets of water resource management, so there is always a challenge to pursue and coordinate the different programs at one time. Such coordination takes time and administrative effort to be successful.

There are several funding sources for water quality improvement projects in Ohio. Funding for wastewater and drinking water infrastructure improvement projects is available through Ohio EPA (WPCLF and WSRLA), the Ohio Water Development Authority (OWDA), Ohio Public Works Commission (OPWC), U.S. Department of Agriculture (USDA) Rural Development and the Community Development Block Grant (CDBG) program. An Ohio EPA publication titled, “State and Federal Funding for Drinking Water and Wastewater Systems” details some of these funding sources.

There is also funding available for preservation, conservation and restoration projects that directly benefit water quality. These include the Clean Ohio Fund, Section 319 Grants Program, Surface Water Improvements Fund (SWIF), GLRI, Conservation Reserve Program (CRP) and Ohio EPA’s WRRSP. Additional funds from the federal government, as well as the investment in water pollution control measures made by municipal and county governments and the private sector, are the reason for dramatic improvements in water quality in Ohio since the inception of the federal CWA in 1972.

A summary of funding sources, amounts and trends is presented here. The summary is not exhaustive. Efforts have been made to include funding sources not traditionally associated strictly with water quality improvement, but that nevertheless have the potential to positively impact Ohio’s water resources.

Clean Ohio Fund
Although not tied directly to measures of water resource improvement, a major Ohio bond fund provides funds for projects that should positively impact water quality in the state. The Clean Ohio Fund, created in November 2000, provides $400 million over four years for “Brownfield” environmental cleanup projects and “Greenfield” open space and conservation preservation projects. Placed before Ohio's voters as Issue 2 in 2008, the ballot initiative was overwhelmingly approved in all 88 counties, which extended the Fund with another $400 million bond program. The Fund consists of four competitive funding programs, as described below.

Table C-1. Descriptions of Clean Ohio Fund programs.

Clean Ohio Program	Purpose	Administered by	Funding/year
Clean Ohio Green Space Conservation Program	funds preservation of open spaces, sensitive ecological areas and stream corridors	Ohio Public Works Commission	$37,500,000
Clean Ohio Agricultural Easement Purchase Program	supports the permanent preservation of Ohio's most valuable farmland through the purchase of development rights	Department of Agriculture	$6,250,000
The Clean Ohio Trails Fund	improve outdoor recreational opportunities by funding trails for outdoor pursuits of all kinds	Ohio Department of Natural Resources	$6,250,000
The Clean Ohio Revitalization Fund	cleanup of polluted properties so that they can be restored to productive uses	Ohio Department of Development and Ohio EPA	$50,000,000

More information about Clean Ohio Fund can be found at https://development.ohio.gov/cleanohio/; information about the Clean Ohio Trails Fund can be found at http://realestate.ohiodnr.gov/outdoor-recreation-facility-grants.

Ohio Water Development Authority

OWDA offers financial assistance for a number of project types, either alone or in conjunction with a state agency (including Ohio EPA). In addition to solid waste, brownfields and emergency programs, OWDA oversees the Fresh Water Program. The Fresh Water Program is a market-based rate program that mirrors the below-market financing available through the WSRLA and the WPCLF (see below). The OWDA 2014 annual report provides an overall summary of loan expenditures for all State of Ohio water and wastewater programs in 2014 (OWDA 2015). More information about OWDA can be found at http://www.owda.org/owda0001.asp?PgID=homepage.

Table C-2. OWDA loans administered during calendar years 2013 - 2014.

	2014		2013		
Project Type	Number	Amount (mil $)	Number	Amount (mil $)	% of 2013
Planning					
Water	28	7.1	25	7.8	90.9
Wastewater	55	37.6	36	53.3	70.5
Subtotal	83	44.7	61	61.1	73.6
Construction					
Water	80	135.7	81	175.6	77.3
Wastewater	80	414.2	99	360.0	115.1
Subtotal	160	549.9	180	535.6	103.4
Total	243	594.7	241	596.7	100.4

Water Supply Revolving Loan Account Fund

The Ohio Water Supply Revolving Loan Account (WSRLA) provides an opportunity for mutually beneficial partnerships between Ohio EPA and Ohio's public water systems to assure a safe and adequate supply of

drinking water for all the citizens of Ohio. This is accomplished primarily by providing below-market interest rates for compliance related improvements to community (public) water systems and non-profit non-community public water systems. Additionally, the WSRLA can provide technical assistance to public water systems in a variety of areas from the planning, design and construction of improvements to enhancing the technical, managerial and financial capacity of these systems.

The WSRLA is administered by Ohio EPA's DDAGW and DEFA. Certain financial management services are also provided by OWDA. More information about WSRLA can be found at http://www.epa.ohio.gov/defa/EnvironmentalandFinancialAssistance.aspx.

Water Pollution Control Loan Fund

Municipal wastewater treatment improvements—sewage treatment facilities, interceptor sewers, sewage collection systems and storm sewer separation projects—and nonpoint pollution control projects are eligible for financing under the WPCLF. This state revolving fund, jointly administered by Ohio EPA and OWDA, was established in 1989 to replace the Construction Grants Program.
Construction loans from the WPCLF are available at a number of interest rates: a standard rate, which is below market rates; a small community interest rate, which is below the standard interest rate; and 1 percent and 0 percent interest rate loans for hardship communities.
Planning and design loans are available at a short-term interest rate. Applications for WPCLF loans are made to Ohio EPA's Division of Environmental and Financial Assistance. Eligible activities include:

- improvements to and/or expansions of wastewater treatment facilities
- improvement or replacement of on-lot wastewater treatment systems
- brownfield/contaminated site remediation
- agricultural runoff control and BMPs
- urban storm water runoff
- septage receiving facilities
- landfill closure
- septic system improvement
- development of BMPs
- forestry BMPs

More information about WPCLF can be found at http://epa.ohio.gov/defa/ofa.aspx#169558732-water-pollution-control-loan-fund-wpclf--wastewater-collection-and-treatment.

Water Resource Restoration Sponsor Program (WRRSP)

A satellite program of the WPCLF is the Water Resource Restoration Sponsor Program (WRRSP). The WRRSP was developed by Ohio EPA and has been a part of the WPCLF since 2000. The intent of the WRRSP is to address a limited and under-assisted category of water resource needs in Ohio through direct WPCLF loans. The goal of the WRRSP is to counter the loss of ecological function and biological diversity that jeopardize the health of Ohio's water resources. The program achieves this goal by providing funds, through WPCLF loans, to finance implementation of projects that protect or restore water resources, by ensuring either maintenance or attainment of warmwater habitat or higher designated aquatic life uses under Ohio's water quality standards.

Since its inception, over $160 million has been awarded for water resource restoration and protection through the WRRSP.

Section 319 Grants Program

Ohio EPA receives federal CWA Section 319(h) funding to implement a statewide NPS program, including offering grants to implement local projects to reduce the impacts of nonpoint sources of pollution. Annual funding for local sub grant awards typically averages $3 million. Section 319(h) grants are awarded for projects such as low-head dam removal, natural stream channel reconstruction, urban storm water infrastructure retrofits, wetland restoration or other projects designed to restore impaired waters. Projects identified in watersheds with TMDLs and/or with endorsed watershed action plans that are aimed at eliminating identified sources of impairment or restoring impaired waters are most likely to receive funding. Other eligible activities include lake management projects and demonstration projects focused on agricultural BMPs that are not typically funded under Farm Bill programs. Nearly all successful grant applications are from watersheds that have either completed an endorsed local watershed action plan or in watersheds where TMDL studies have been completed.

More information about the Section 319 Grants Program can be found at http://epa.ohio.gov/dsw/nps/index.aspx#120843256-for-additional-information.

Federal Farm Bill Funding in Ohio

Among funding sources from the federal government, those conservation programs connected to the "Agricultural Act of 2014" legislation are notable. Administered by USDA, several programs provide cost share, technical assistance and economic incentives to install and/or implement NPS pollution management practices. The 2014 Farm Bill included significant changes in programs such as:

- consolidation of conservation programs for flexibility, accountability and adaptability at the local level;
- linkage of basic conservation practices to crop insurance premium subsidy for highly erodible lands and wetlands; and
- building upon previous successful partnerships and encouraging agricultural producers and partners to design conservation projects that focus on and address regional priorities.

Ohio EPA works closely with Ohio Natural Resources Conservation Service (NRCS) on several water quality related landscape initiatives including: GLRI, the National Water Quality Initiative (NWQI) and the Mississippi River Basin Initiative (MRBI). Ohio EPA has assisted with selecting priority watersheds and practices in these initiatives and provides water quality monitoring.

Set-aside types of programs, such as the Conservation Reserve Program (CRP) and the Conservation Reserve Enhancement Program (CREP), are the most popular of available conservation programs available in Ohio. Targeted acreage through these programs is intended to be environmentally sensitive for land that can have a particularly deleterious impact on natural resources when farmed. Examples include highly erodible land, land near waterways, land that was formerly wetland and lands that can serve as habitat critical to declining wildlife populations. It is a potential concern that once contracts expire on the marginal or environmentally sensitive lands, those acres may revert back to agricultural production.

Conservation Reserve Enhancement Program

The CREP is a federal-state conservation partnership program that is intended to remove environmentally sensitive cropland from production and to convert it to native grasses, trees and other vegetation. The CREP uses financial incentives to encourage farmers and ranchers to enroll in contracts of 10 to 15 years. In return, participants are incentivized annually 150 to 175 percent of crop rental

rates, depending on the type of vegetation planted. Ohio is one of two states in the nation to have three CREP watersheds. Most existing CRP and CREP land retirement program acres involve stream-side grass strips not specifically designed to treat agricultural runoff generated from contributing cropland acreage. There are opportunities to further expand acreage under these programs to include practices that better reduce rate and amount of agricultural runoff. These practices include filter area, wooded riparian corridors and/or wetlands designed to trap, retain, intercept, distribute, store and/or treat runoff from cropland.

Environmental Quality Incentives Program
The Environmental Quality Incentives Program (EQIP) is another widely used, well-funded program coming out of the Farm Bill. EQIP is designed to improve management practices and facilities on working farms to achieve environmental quality goals, of which protecting water resources is a high priority. Several specific practices are eligible for funding through EQIP that cover broad categories such as nutrient and pesticide management and storage, manure management and storage, livestock fencing, conservation tillage, cover cropping, conservation crop rotation and drainage water management, among others. Historically, most EQIP-funded practices in Ohio have gone toward installation of tangible items (e.g., fencing, access roads and manure storage units). Recognizing that NPS pollution from agriculture is largely related to management (e.g., crop rotations and tillage management, or fertilizer application timing, method, rate and form), Ohio-NRCS offered incentive payments to farming operations to adopt a suite of management practices, including conservation tillage, nutrient management plan implementation and cover crops.

Conservation Stewardship Program
The Conservation Stewardship Program (CSP) is a voluntary program that encourages producers to improve conservation systems by improving, maintaining managing and undertaking additional conservation activities. NRCS administers this program and provides financial and technical assistance to eligible producers. CSP offers participants two possible types of payments: annual payment for installation and adoption of additional activities and the improvement, maintenance and management of existing activities; and supplemental payment for the adoption of resource-conserving crop rotations. Such rotations are those that reduce erosion, improve soil fertility and tilth and include at least one resource conserving crop (e.g., perennial grass, legume, or grass/legume grown for use as forage, seed for planting or green manure).

More information on the Agricultural Act of 2014 and related programs in Ohio is available at http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/farmbill/ and http://www.nrcs.usda.gov/wps/portal/nrcs/site/oh/home.

Surface Water Improvement Fund Grants Program
The NPS program continues to administer of the Surface Water Improvement Fund (SWIF) grants program. The SWIF program enhances Ohio EPA's NPS improvement efforts by providing $1 million to $3 million per funding cycle (approximately once every two years) in additional funding for locally implemented nonpoint source, stream restoration and innovative storm water management projects. The initial SWIF cycle in 2010 resulted in awarding a total of $3.45 million to fund 32 individual projects. These grants were provided for projects such as storm water demonstration, stream and wetland restoration, agricultural BMPs and inland lake protection.

SWIF grant funds were also used in fiscal year 2012 to match federal GLRI funds to implement a GLRI SWIF project with specific focus in Cuyahoga County (including Cleveland and its metropolitan area)

where 17 projects were awarded grants totally $2.05 million. This success spawned a similar project: the Lucas County (including Toledo and its metropolitan area) SWIF in 2013.

For fiscal year 2014, Ohio EPA received 68 applications for SWIF grants. Of the applications received, grants totaling $1,966,508 were awarded to 19 recipients statewide (except Lake Erie watershed). In the Lake Erie watershed, $2,195,984 in SWIF grants was awarded to 24 recipients.

More information on the SWIF grants program is available at http://www.epa.state.oh.us/dsw/nps/swif.aspx.

C7. Harmful Algal Blooms Responses and Assessments

Cyanobacteria are photosynthesizing bacteria, commonly called blue-green algae. Some are capable of producing toxins (cyanotoxins) that affect the skin, liver or nervous system. They can also cause water quality deterioration associated with excessive biomass production (such as depleted dissolved oxygen levels, fish kills, taste and odor problems in drinking water and elevated trihalomethane levels). A large bloom of cyanobacteria that causes harmful effects is called a harmful algal bloom (HAB).

Cyanobacteria have the ability to adapt to a wide range of temperatures and water flow regimes, contributing to their common occurrence across Ohio waters. The presence of cyanobacteria is not necessarily a concern, but harmful blooms can form when conditions are favorable for rapid growth. When excess nutrients are present, especially phosphorus, these bacteria can form expansive blooms and produce cyanotoxins at levels of concern for humans and animals.

The harmful effects of these blooms are well documented in scientific literature and recognized by U.S. EPA, Center for Disease Control (CDC) and World Health Organization (WHO) as causing acute and chronic impacts in human and animal populations. U.S. EPA recognizes that HABs are increasing in spatial and temporal prevalence in the U.S. and worldwide and that their highly potent toxins are a significant hazard for human health and ecosystem viability. In early 2015, U.S. EPA issued health advisory levels for two cyanotoxins, microcystins and cylindrospermopsin. Ohio Senate Bill 1 was passed in July 2015 and directed Ohio EPA to implement actions to protect against cyanobacteria in the western basin on Lake Erie and in public water supplies. This legislation led to creation of

Ohio Revised Code 3745.50 authorizing the director to Ohio EPA to serve as the coordinator of harmful algae management and response. Ohio EPA was required to implement actions that manage wastewater and limit nutrient loading and develop and implement protocols and actions to protect against cyanobacteria and public water supplies. Ohio adopted new and revised rules, effective June 1, 2016, to meet these requirements. Cyanotoxins are not currently regulated in recreational waters, however, USEPA is developing national guidance and thresholds that may be issued during the next reporting cycle. In 2016, Ohio EPA created a new Harmful Algal Bloom Section housed in the Division of Drinking and Ground Waters to manage both drinking water and recreational response.

Response to HABs

As incidents of HABs have increased, Ohio's response continues to evolve. The State has annually revised the State of Ohio's Harmful Algal Bloom Response Strategy for Recreational Waters (http://epa.ohio.gov/portals/35/hab/HABResponseStrategy.pdf) and the Public Water System Harmful Algal Bloom Response Strategy. Ohio EPA, ODH and ODNR have continued a close partnership to develop and implement the unified state response strategy. The ohioalgaeinfo.com web site provides background information about HABs; tips for staying safe when visiting public lakes; links to sampling information; and current advisories and contact information for reporting suspected HABs. It also includes historic and current cyanotoxin data for public water supplies and a link to the ODH BeachGuard site, which has information about recreation advisories for both bacteria and algae (http://publicapps.odh.ohio.gov/BeachGuardPublic/Default.aspx).

HAB Recreational Advisories

Advisories are designed to provide information and warnings to protect public health from the potential health impact of cyanotoxins present in HABs. Beginning in 2011, general information signs were placed in areas where HABs have been observed at State Park beaches. These signs encourage beachgoers to be alert for HABs and provide information about their appearance. In addition, the HAB advisory system was changed to a two-level system. A "Recreational Public Health Advisory" (PHA) is posted when toxin levels equal or exceed the established state benchmark criteria. Microcystin is the focus of toxin analysis. When microcystin levels exceed 6 ppb, a PHA is posted. When microcystin levels reach 20 ppb or above then an "Elevated Recreational Public Health Advisory" is posted. Recreational advisory posting and removal protocols are outlined in Ohio's HAB Response Strategy for Recreational Waters. In 2015, the highest level of recreational advisory was a "No Contact Advisory" that required microcystin levels ≥ 20 and a confirmed human or animal illness. The numeric thresholds for cyanotoxins in recreational waters remained the same in 2016, but the advisories were changed to "Recreational Public Health Advisory" and "Elevated Recreational Public Health Advisory." The human or animal illness requirement was also removed for the highest advisory (Elevational Public Health Advisory).

In 2013, blooms were reported at eight State Park lakes and three State Park Lake Erie beaches. A bloom was monitored at Buck Creek (C.J. Brown Reservoir) between June 5, 2013, and August 29, 2013, but microcystin levels did not exceed the 6 ppb threshold criteria for recreational waters, so no advisory was posted. In addition, blooms were reported at Lake Alma, Dillon Lake, Madison Lake and Lake Hope State Parks but no advisories were needed. There were four PHAs posted at State Park facilities in 2013. Three of these were for inland lakes (Grand Lake St. Marys, Buckeye Lake and East Fork or Harsha Lake) and one for a beach on Lake Erie as follows:

1. **Grand Lake St. Marys** (PHA posted 5/20/13) – Levels above threshold through 9/24/13 when sampling ceased. The highest microcystin levels were >100 ppb on 5/20/13 and 5/28/13 at Windy Point.

2. **Buckeye Lake** (PHA posted 7/31/13) – Levels above threshold through 10/16/13 when sampling ceased. The highest microcystin level was 220 ppb at Fairfield Beach on 9/4/13.
3. **East Fork** (Harsha Lake) (PHA posted 6/12/13) – Levels above threshold through 7/2/13. The highest microcystin level was 88 ppb on 6/12/13. This is the first time that this lake was posted with a PHA.
4. **Maumee Bay State Park Beach** (PHA posted 6/4/13) – Levels above threshold through 8/5/13. The highest microcystin level was 20 ppb on 6/4/13. Levels then dropped dramatically for most of the summer. Then microcystin spiked at 6.9 on 8/5/13.

Between September 1, 2013, and September 1, 2014, blooms were reported at 12 State Park lakes. Seven other blooms were reported in other waters during this fiscal year. Four of these were in other public lakes; one was in a tributary to the Ohio River; one from Kelleys Island and one from Johnsons Island, Lake Erie.

Table C-3. Bloom reports, PHAs and microcystin levels reported in 2014 (SP = state park).

Table Location	Date	Cyanotoxin
Grand Lake St. Marys	PHA posted 5/20/14	92.8 ppb to >100 ppb microcystins
Jefferson Lake SP	5/28/14	--
Indian Lake SP	6/3/14	Non-detect microcystins
East Fork (Harsha Lake) SP	PHA posted 6/18/14	190 ppb microcystins
Alum Creek SP	6/9/14	Non-detect microcystins
Buckeye Lake SP	PHA posted 6/2/14	57-77 ppb microcystins
Acton Lake- Hueston Woods SP	7/7/14	Non-detect microcystins
Chippewa Lake	7/11/14	--
Lake Alma SP	7/15/14	Non-detect microcystins
Punderson SP	7/15/14	Non-detect microcystins
Boy Scout Camp lake in Clermont County	7/21/14	--
Maumee Bay SP	PHA posted 7/21/14	7.1 ppb microcystins
Lake Hope SP	7/20/14	Non-detect microcystins
Forked Run SP	7/25/14	--
Lake Mac-o-Chee Boy Scout Camp	7/29/14	Non-detect microcystins
Bullskin Creek	8/3/14	--
Mogadore Reservoir, Portage County	8/6/14	--
Kelleys Island	8/22/14	--

Of the State Park beaches with blooms tested for microcystins, seven had non-detectable microcystins. There were four PHAs posted at State Park lakes in 2014: 1) Grand Lake St. Marys (GLSM); 2) Buckeye Lake; 3) East Fork (Harsha Lake); and 4) Maumee Bay State Park beaches. ODH reported no probable cases for human or animal illness associated with cyanotoxin exposure in 2014.

Observations 2011-2014

Ohio collected a considerable amount of microcystin and phytoplankton data for Buckeye Lake and GLSM over the past four years. The data show increasing toxin levels in GLSM over this time period (see graphs below). The graphs of the microcystin data for both Buckeye Lake and GLSM show an undulating pattern in microcystin levels (especially for GLSM) showing a release of toxins followed by a period of reduced toxin production and/or toxin degradation.

The data also show that toxin levels can remain elevated into the winter months; ether because there is less toxin degradation in those months and/or there is additional toxin release. For example, on December 11, 2013, there was still 10.3 ppb microcystin detected at the GLSM drinking water intake.

Microcystin levels at Buckeye Lake were higher in 2013 and 2014 than in 2011 and 2012. The 2013 data show a great deal of fluctuation and a couple spikes in microcystin. On June 9, 2014, just at the start of the recreational season, microcystin was already at 19 ppb at Crystal Beach which was above the PHA level. Microcystin data collected by Ohio EPA Central District Office in the open waters of Buckeye Lake showed microcystin levels were also above the PHA threshold.

Some of the highest toxin levels at Buckeye Lake and GLSM occurred in the early spring around the beginning of the 2014 recreational season. For example, on May 9, 2014, there were >100 ppb microcystin detected at the GLSM drinking water intake. On May 20, there were >100 ppb microcystin at Windy Point beach and Camp Beach at GLSM. On May 27, 2014, there were 144 ppb at GLSM Windy Point Beach. There were also some late peak toxin levels, like at Maumee Bay State Park beach where microcystin levels reached 110 ppb on August 4, 2014.

The highest toxin level reported in recreational waters during this time period was 220 ppb at Fairfield Beach at Buckeye Lake. Close behind was 190 ppb at East Fork Campground Beach on June 18, 2014. PHAs were posted at all the State Park beaches at Buckeye Lake and GLSM throughout the 2014 recreational season; however, the East Fork PHA was removed earlier on July 26, 2014.

Euglena sanguinea was reported for the first time in a channel on the south side of GLSM in early September, 2013, about two miles from the drinking water intake. DDAGW sampled the raw and finished water at the drinking water intake about one week after the bloom was observed. *Euglena* spp. are not cyanobacteria, but are unicellular flagellate protists. This organism is capable of producing the icthyotoxin, euglenophycin, which is extremely toxic to fish and can cause large kills.

The open water samples collected by the Inland Lakes Team showed that high concentrations of potential toxin producing cyanobacteria were not producing cyanotoxins of significance in the open water (see tables in Section I.4.3.1.) *Pseudanabaena* spp., *Aphanocapsa* spp. and *Cylindrospermopsis* spp. were the dominant cyanobacteria in open waters during 2013-2014.

At the present time, Ohio EPA does not list lakes as impaired for recreational use when recreational advisories are posted at public beaches. Addressing water quality impairments in the lake's watershed should eventually reduce nutrient enrichment in lakes and thereby reduce cyanobacteria blooms.

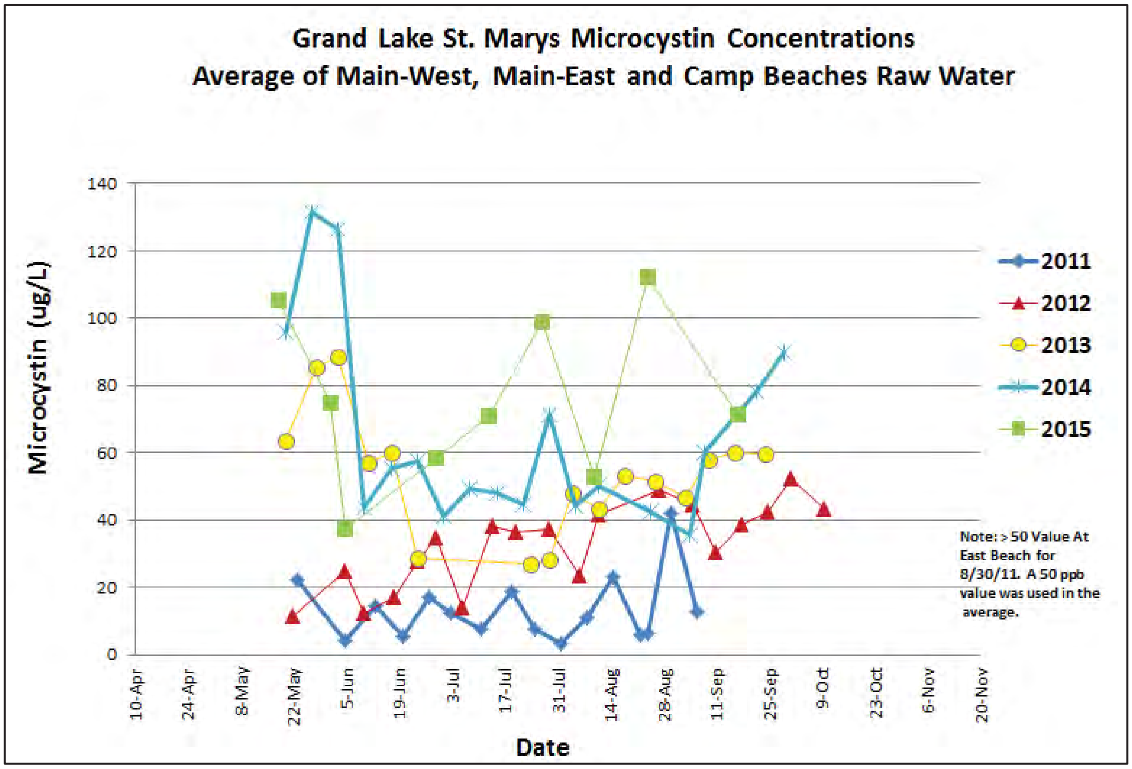


Figure C-2. Microcystin concentration in GLSM during recreational seasons from 2011 to 2015.

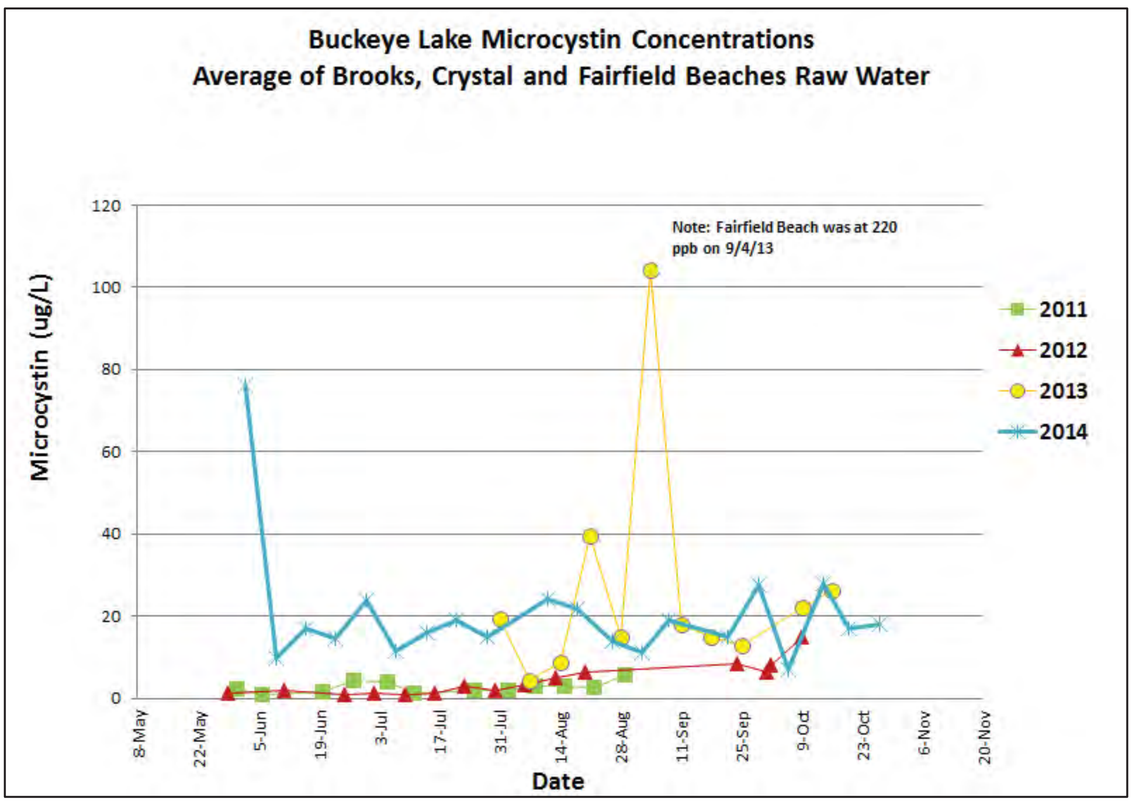


Figure C-3. Microcystin concentration in Buckeye Lake during recreational seasons from 2011 to 2015.

Algal Toxin Monitoring and Phytoplankton Monitoring
Monitoring of HABs has occurred in a variety of ways across the state. The main types of monitoring that have taken place are discussed below. Algal toxin monitoring at public water systems is addressed in Section H.

Algal Toxin and Phytoplankton Monitoring by the Inland Lakes Team
The Inland Lakes Monitoring Program continues to collect phytoplankton and microcystin samples from the lakes sampled each year as part of the routine sampling of lakes in TMDL watersheds. Those samples were collected in open water at established sampling locations. In 2013 and 2014, phytoplankton and microcystin samples were collected three times each year. Sampling locations with cyanobacterial cell counts of 100,000 cells/mL or greater of potential microcystin or cylindrospermopsin producers are identified in Tables C7-2 through C7-5 below.

Table C-4. Open water sampling locations in 2013 with cyanobacterial cell counts of 100,000 cells/mL or greater of potential microcystin producers (*= dominant cyanobacteria. *Aphanizomenon* spp. are not included as a potential microcystin producer since there is some disagreement about this).

Lake	Date	Cyanobacteria Genera	Microcystins
Nettle Lake L-2	5/21/2013	**Pseudanabaena*	Non-detect
Clendening Lake L-1	5/29/2013	*Planktothrix, *Pseudanabaena*	Non-detect
Clendening Lake L-2	5/29/2013	**Pseudanabaena*	Non-detect
Tappan Lake L-1	5/29/2013	**Pseudanabaena*	Non-detect
Tappan Lake L-2	5/29/2013	*Anabaena, Planktothrix, *Pseudanabaena*	Non-detect
Nettle Lake L-1	7/17/2013	*Aphanocapsa, *Pseudanabaena*	--
Hoover Reservoir L-1	7/18/2013	*Anabaena, *Aphanocapsa, Microcystis, Planktothrix, Pseudanabaena*	0.47 ppb
Stonelick Lake L-1	9/10/2013	*Aphanocapsa, *Pseudanabaena, Anabaena*	0.32 ppb
Tappan Lake L-1	10/1/2013	*Anabaenopsis, *Aphanocapsa, Microcystis, Pseudanabaena*	--

Table C-5. Open water sampling locations in 2013 with cyanobacterial cell counts of 100,000 cells/mL or greater of potential cylindrospermopsin producers: (*= dominant cyanobacteria Cylindrospermopsis spp. are known to produce cylindrospermopsin, but this is rarely observed in Ohio).

Lake	Date	Cyanobacteria Genera	Cylindrospermopsin
Hoover Reservoir L-1	7/16/2013	*Anabaena, Aphanizomenon, *Cylindrospermopsis*	Non-detect
Clendening Lake L-1	9/10/2013	*Cylindrospermopsis, Raphidiopsis*	--
Clendening Lake L-2	9/10/2013	**Cylindrospermopsis, *Raphidiopsis, Anabaena*	--
Alum Creek L-1	9/10/2013	*Aphanizomenon, *Aphanocapsa, Pseudanabaena*	--
Piedmont Lake L-1	9/10/2013	*Anabaena, Cylindrospermopsis, *Raphidiopsis*	0.436 PPB
Piedmont Lake L-2	9/10/2013	*Anabaena, *Cylindrospermopsis, Raphidiopsis*	--
Tappan Lake L-1	10/1/2013	**Cylindrospermopsis, Raphidiopsis*	--
Tappan Lake L-2	10/1/2013	**Cylindrospermopsis, Raphidiopsis*	--

Table C-6. Open water sampling locations in 2014 with cyanobacterial cell counts of 100,000 cells/mL or greater of potential microcystin producers: (*= dominant cyanobacteria. Aphanizomenon spp. are not included as a potential microcystin producer since there is some disagreement about this).

Lake	Date	Cyanobacteria Genera	Microcystins
Senecaville Lake L-2	7/17/2014	*Anabaena, Aphanocapsa, *Pseudanabaena*	Non-detect
New Concord Reservoir	7/8/2014	*Aphanizominon/Anabaena*	Non-detect
Winton Lake L-1	7/15/2014 and 9/23/2014	**Aphanocapsa, Pseudanabaena/Anabaena, *Aphanocapsa, Pseudanabaena*	--
Salt Fork Lake L-2	7/16/2014	*Aphanocapsa, Pseudanabaena*	Non-detect
Hoover Reservoir	8/14/2014	*Anabaena, *Aphanocapsa*	0.55 ppb

Table C-7. Open water sampling locations in 2014 with cyanobacterial cell counts of 100,000 cells/mL or greater of potential cylindrospermopsin producers: (*= dominant cyanobacteria Cylindrospermopsis spp. are known to produce cylindrospermopsin, but this is rarely observed in Ohio).

Lake	Date	Cyanobacteria Genera	Cylindrospermopsin
New Concord Reservoir L-1	6/17/2014 and 7/8/2014	**Aphanizomenon*	Non-detect on both dates
Salt Fork Lake L-1	7/16/2014	**Aphanizomenon, Cylindrospermopsis*	Non-detect
Salt Fork Lake L-2	7/16/2014	**Cylindrospermopsis*	Non-detect
Salt Fork Lake L-3	7/16/2014	**Cylindrospermopsis*	Non-detect

Algal Toxin Monitoring – Accumulation in Fish Tissue

Because of the uncertainty associated with freshwater algal toxin analysis in fish tissue and the lack of a reliable, U.S. EPA-approved analytical method for microcystin and other algal toxins in fish tissue, the effect of HABs on human health via fish consumption in freshwater systems cannot be definitively determined at this time.

Ohio EPA has conducted multiple surveys looking for microcystin in fish tissue since 2010, primarily in GLSM and more recently in Lake Erie. In general, a large majority of these samples have not had any detections for microcystin, while a few samples have had microcystin detections at relatively low levels.

Early in this investigation, Ohio EPA, ODNR and Ohio Department of Health chose to place a consumption advisory ("do not eat more than one meal per week") on black crappie in GLSM. This "one meal per week" advisory level is equivalent to Ohio's statewide advisory due to mercury, so anglers following the statewide advisory would also be protected from microcystin in GLSM fish. This species represented the worst-case scenario observed in Ohio's waters. Continued investigation has shown a decline in reported microcystin concentrations in GLSM fish, although it is unclear if this is due to a change in toxin concentrations or improvements in the analytical methods.

As the analytical methods and risk assessment continue to evolve, a strong weight-of-evidence is emerging that algal toxins in Ohio fish tissue present a very low risk to consumers of fish, both in Lake Erie and GLSM. Ohio EPA and ODNR are currently planning to continue annual monitoring of fish in these two waterbodies to ensure the safety of fish in Ohio's waters affected by algal blooms.

Use of Satellite Imagery to Evaluate HABs on Lake Erie and Inland Lakes

NOAA continues to provide processed satellite imagery that identifies cyanobacteria and estimates their abundance based on their unique spectral reflectance. NOAA's experimental Lake Erie forecast system,

which predicts cyanobacteria bloom movement based on a hydrodynamic model of the lake, will go operational the summer of 2016, demonstrating NOAA's continued support for this service. The forecasts are included in the Lake Erie HAB bulletins, which are provided to thousands of subscribers in the state, including state agencies, public water systems, beach managers and the general public. More information on the HAB bulletins is available here: http://www.glerl.noaa.gov/res/Centers/HABS/. A new satellite and sensor that will improve bloom detection capabilities and enable detection of HABs on larger inland lakes was successfully launched in 2016. Ohio is one of three states collaborating with NOAA on application of the new satellite data to inland lakes.

Outreach

Ohio EPA continues to coordinate a workshop at Ohio Sea Grant Stone Laboratory in August of each year. This two-day workshop, "Dealing with Cyanobacteria, Algal Toxin and Taste and Odor Compounds," attracts public water supply operators and water managers from Ohio and other states. Instructors include experts from NOAA, OSU and public water supply operators with experience dealing with HABs. Topics covered include ecology of cyanobacteria, limnology concepts, cyanotoxin impacts, historical outbreaks, cyanobacteria relationship with taste and odor compounds, HAB identification, tracking HABs with satellites, using ELISA to evaluate HAB toxins, cyanobacterial cell and toxins removal options, reservoir and source management, sampling and monitoring demonstrations and update on state HAB initiatives.

In 2013, presentations were given at the Non-Point Source Conference, OSU and four other HAB-related speaking engagements, including one at Presque-Isle, Pennsylvania at the request of Pennsylvania Sea Grant. In 2014 presentations were given at OSU, the National Academy of Science, the Warren County Health Department conference and Columbus Bar Association.

Addressing HABs at the Source

In addition to carrying out the HAB strategy and revising the strategy as needed, the State of Ohio continues to seek ways to address the root cause of HABs—excessive nutrients that enter the State's waterways. Ohio EPA, in collaboration with ODNR, ODA, OSU and other third party collaborators, has updated the 2013 Ohio Nutrient Reduction Strategy. The 2015 Addendum describes new initiatives and summarizes progress in the more established programs and activities intended to reduce the loss of nutrient to surface and ground waters. All strategy documents are available on-line at this website http://epa.ohio.gov/dsw/wqs/NutrientReduction.aspx.

C8. New 303(d) Vision Implementation in Ohio

In December 2013, U.S. EPA announced a new "Vision" for the CWA Section 303(d) program to provide an updated framework for implementing the responsibilities under the impaired waters program. U.S. EPA recognized that "… there is not a one-size-fits-all approach to restoring and protecting water resources." Under the new Vision, states will be able to develop tailored strategies to implement the 303(d) program in the context of their water quality goals.

The Vision effort grew out of frustration caused by the 1990s-era litigation concerning the pace at which TMDL analyses were being completed. The resulting consent decrees forced many states to produce great *quantities* of TMDLs that many felt did not contain the necessary *quality* to effectively improve water quality. As the decrees were completed, discussion centered on how to produce better TMDLs that could be implemented to bring about measureable improvements in the quality of the nation's

waters.

Fortunately, Ohio was not burdened by a harsh consent decree and was able to carefully consider how to proceed with TMDLs. Fifteen years ago, Ohio EPA developed an approach to TMDLs that already aligns with the spirit of the Vision. The Ohio TMDL program strives to:

- focus on CWA responsibilities across programs;
- build on the state's investments in monitoring, especially biological monitoring;
- use data efficiently, for multiple programs and purposes;
- restore beneficial uses;
- focus on watersheds: maintain rotating basin structure to enable adaptive management; and
- recognize that water quality is impacted by the actions of many and that it will change over time.

Ohio's program grew out of the Agency's water mission, which is rooted in the CWA. Today's new national Vision developed from the same roots, so it should not be surprising that Ohio has been on the Vision path for several years.

Ohio TMDL Program Relative to the Vision Goals

The national Vision contains six goal statements related to prioritization, assessment, protection, alternatives, engagement and integration. While its TMDL program is generally well placed relative to these goals, Ohio expects to continue to improve its program; potentially the biggest opportunities are in the areas of protection and engaging other organizations to help with implementation. The following is a summary of the goals and how Ohio has been addressing each goal to date as detailed in the U.S. EPA document titled, "A Long-Term Vision for Assessment, Restoration and Protection under the Clean Water Act Section 303(d) Program" (U.S. EPA, 2013). https://www.epa.gov/sites/production/files/2015-07/documents/vision_303d_program_dec_2013.pdf.

Prioritization Goal

> *For the 2016 integrated reporting cycle and beyond, States review, systematically prioritize, and report priority watersheds or waters for restoration and protection in their biennial integrated reports to facilitate State strategic planning for achieving water quality goals.*
>
> The intent of the Prioritization Goal is for States to express CWA 303(d) Program priorities in the context of the State's broader, overall water quality goals.
>
> *-- U.S. EPA, 2013*

Based on the state's established monitoring investment and expertise, Ohio's initial priority (in approximately 2000) was on aquatic life use impairments in streams. This priority led to the development of nutrient, sediment, habitat, dissolved oxygen and related TMDLs. A couple of years later, the agency began to focus on recreation use impairments, which yielded bacteria TMDLs. More recently, work has involved public drinking water use impairments involving nitrate and pesticides TMDLs.

In addition to a focus on restoring uses, other priorities were to begin with headwaters and work downstream. To date, the state has not adopted a geographic priority, choosing instead to work statewide which helps to maintain work balance among district offices. In cases where other agencies

or stakeholders have initiated projects, TMDLs in watersheds has been delayed.

Moving forward, Ohio intends to use the following prioritization framework (**bold** items indicate clarification or change from past practices):

Long Term General Priorities:

- continue to work statewide, using rotating basin scheduling for assessment and listing **but on a more limited basis to allow for increased focus on lakes and protecting downstream uses**
- sharpen focus on Public Water Supply Use
- **Incorporate HAB considerations into priorities (both PDWS use and ultimately Recreation use)**
- concentrate recreation TMDLs on **High-Use** recreation waters
- continue to make mercury and legacy/sediment metals low priority TMDLs as other approaches are anticipated to be more effective

Annual Prioritization of Impaired Waters for TMDL Development:
Ohio will continue to use the Priority Point System in Section J2 of the IR. Points are given for presence and severity of Human Health impairment, Recreation Use impairment, Public Water Supply impairment and Aquatic Life Use impairment. Scores by HUC12 range from 1-16.

In addition, the Agency will consider geographic coverage, severity of the impairments represented by the above scores/points for the entire project area and add the following considerations:

- Social Factors (highly used recreational waters, drinking water supply for significant populations, ongoing/sustained involvement of any local groups or government, etc.)
- Value Added (is a TMDL the most efficient way to achieve improved water quality?)
- Is there an approved watershed action plan – if so how many implemented projects?
- How much regulatory authority exists over sources?
- Is there an alternative way to improve water quality more quickly than a TMDL? (e.g. immediate implementation of an existing plan or projects, or imposing more stringent permit limits to address a localized problem)
- Are there other factors in play? Examples include:
    - Pending enforcement for a discharger (possible 4B option)
    - USACE modeling of reservoir discharge to improve downstream water quality
    - Local or statewide strategy or requirements in place to address a particular issue/pollutant (e.g. new health department rules for HSTS if they are sole/primary source of impairment)

Over time, Ohio will strive to develop a more objective system for weighing the social factors and value added concepts. In each IR, the state plans to provide results of the most recent assessments and prioritization exercise as outlined above; list resulting high priority TMDL projects; and include schedules for those anticipated to be completed in the next two years.

Assessment Goal

By 2020, States identify the extent of healthy and CWA Section 303(d) impaired waters in each State's priority watersheds or waters through site-specific assessment.

The purpose of this Goal is to encourage a comprehensive understanding of the water quality status of at least each State's priority areas.

-- U.S. EPA, 2013

Ohio has maintained a robust biology and chemistry monitoring program for more than 30 years, maintaining consistent protocols and systematically expanding into new water body types. Assessments are based on surveys conducted using a rotating basin approach. The assessments use site-specific data of the highest quality and the status of waters is reported in watershed reports and summarized in biennial IRs that meet the reporting requirements of CWA 305(b) and 303(d). A framework of goals and measures has been in place for several years and reported on biennially in the Ohio IR.

Protection Goal

For the 2016 reporting cycle and beyond, in addition to the traditional TMDL development priorities and schedules for waters in need of restoration, States identify protection planning priorities and approaches along with schedules to help prevent impairments in healthy waters, in a manner consistent with each State's systematic prioritization.

The intent of the Protection Goal is to encourage a more systematic consideration of management actions to prevent impairments in healthy waters (i.e., unimpaired waters) in order to maintain water quality or protect existing uses or high quality waters.

-- U.S. EPA, 2013

Protection of the water resource is built into Ohio's CWA programs in multiple ways. Watershed surveys measure the attainment potential and status for all waters; thus, they identify waters to restore and to protect. Tiered aquatic life uses identify "better than CWA" goals for high-quality streams. About 14 percent of Ohio's streams already have this higher use designation. TMDLs have included protection strategies and "informational TMDLs" to encourage protection of streams currently meeting their designated uses. Ohio also has an active antidegradation process to protect existing uses and plans to update the list of waters afforded higher protection under antidegradation.

Ohio has also issued NPDES permits to protect against water quality impairment and anticipates continuing that approach where warranted. One example is the general construction storm water permits for the Olentangy River and Darby Creek watersheds. Those permits include measures designed to protect the high quality of the streams from development impacts. Other watersheds are being considered for similar actions.

Ohio plans to explore how other types of plans (9 Element Watershed Plans for instance) or regulatory actions could be used more effectively to protect our highest quality waters and/or those that are of high importance for drinking water or recreation.

Alternatives Goal

By 2018, States use alternative approaches, in addition to TMDLs, that incorporate adaptive management and are tailored to specific circumstances where such approaches are better suited to implement priority watershed or water actions that achieve the water quality goals of each state, including identifying and reducing nonpoint sources of pollution.

The purpose of this Goal is to encourage the use of the most effective tool(s) to address water quality protection and restoration efforts.

-- U.S. EPA, 2013

Ohio has been using a number of alternatives to improve water quality. Relying on the biological criteria as the measure for aquatic life attainment means that restoring habitat to build a stream's capacity to process pollutants can be as or more effective than load reduction; Ohio TMDLs have routinely promoted habitat enhancement. After the first few TMDLs recommended dam modifications to enhance capacity, dam modifications were pursued in areas without TMDLs. The state has used CWA Section 319 funds to remove or modify many dams.

In the past, Ohio EPA worked with mining agencies and the Corps to develop a standard alternative for acid mine drainage problems by aligning processes to quantify load reductions, thus meeting the needs of multiple programs with one project. There have also been several instances where NPDES permits have been adjusted to address point source impairments as monitoring identifies them, in advance of completing a TMDL. In other cases, TMDLs have recommended a stressor study to address impairment where the source could not be identified. This follow-up attention increases the chances that the problem may be eliminated or, at a minimum, data will be available for a future TMDL.

Under the new Vision, Ohio EPA also plans to use approaches that are an alternative to a TMDL. These approaches will be designed to address specific impairments caused by pollutants such as phosphorus or perhaps bacteria. Approaches may include developing "9 Element Watershed Plans," revising NPDES permit limits or conditions, funding installation of BMPs, supporting local health departments in implementing new rules for household sewage treatment systems, etc. These approaches will be pursued where there is clear legal authority to do so and circumstances are such that they are likely to result in water quality improvements more efficiently than a TMDL.

Engagement Goal

By 2014, EPA and the States actively engage the public and other stakeholders to improve and protect water quality, as demonstrated by documented, inclusive, transparent, and consistent communication; requesting and sharing feedback on proposed approaches; and enhanced understanding of program objectives.

The purpose of the Engagement Goal is to ensure the CWA 303(d) Program encourages working with stakeholders to educate and facilitate actions that work toward achieving water quality goals.

-- U.S. EPA, 2013

Ohio engages the public and other stakeholders in a number of ways. Ohio EPA maintains an extensive website with information about TMDLs, monitoring and implementation in watersheds across the

state[4].

In addition to the outreach in individual CWA programs, the TMDL program developed a standard TMDL project communication plan to engage the public and government and technical stakeholders within a project area. The plan includes a standard set of meetings, demonstrations, articles, new releases, etc., that are tied to TMDL project milestones.

In recent years, the CWA Section 319 program has strived to reach beyond stakeholders with general interest to focus on local decision makers and groups who have the wherewithal to take action "on the ground" to improve water quality. These include local governments and park districts.

The preparation of the IR (containing the 303(d), or impaired waters, list) is an open process. Several years ago an "incubator" section was added to preview changes that were being contemplated for future listings (e.g., adding new beneficial use analyses, revising methodologies or assessment unit types). The section allows for longer-term feedback for public consideration of changes that can have significant impacts. The IR also includes Ohio EPA's projected monitoring schedule; the draft schedule is frequently changed in response to requests for monitoring from watershed groups, communities or others who are committed to improving their water quality in their area. Ohio will strive to complete the IR every two years so that the process remains dynamic and reliable.

Integration Goal

By 2016, EPA and the States identify and coordinate implementation of key point source and nonpoint source control actions that foster effective integration across CWA programs, other statutory programs (e.g., CERCLA, RCRA, SDWA, CAA), and the water quality efforts of other Federal departments and agencies (e.g., Agriculture, Interior, Commerce) to achieve the water quality goals of each state.

The intent of this Goal is to integrate the CWA Section 303(d) Program with other relevant programs that play a role in influencing water quality, in order to collectively and more effectively achieve the water quality goals of States, Tribes, and Territories.

-- U.S. EPA, 2013

As described earlier, program integration is the foundation of Ohio's TMDL work, including both technical and funding programs. Ohio has adopted the Safe Drinking Water Act into the 303(d) listing process and has completed TMDLs for drinking water impairments. Ohio has directed CWA Section 319 funding to park districts and local governments that can directly implement actions to improve water quality by using TMDLs to identify suitable projects. Ohio EPA has also worked with the U.S. Forest Service, U.S. Army Corps of Engineers and state and federal mining agencies to address common water quality goals and to complete TMDLs and TMDL alternatives.

On a practical level, each TMDL project is completed by a team of Ohio EPA staff that represents many aspects of the clean water programs, including drinking water. The team members include staff from various CWA program areas. At a minimum, these program areas include monitoring and assessment; water quality modeling; NPDES permits; enforcement; water quality standards; and TMDL. Staff from the Agency's Public Water Supply program and Public Interest Center is also part of each team. Ohio EPA

[4] http://epa.ohio.gov/dsw/tmdl/index.aspx

district offices and central office both contribute to the effort. On some projects, local representatives such as active watershed group leaders or Soil and Water Conservation District staff are involved during the study plan phase and throughout the project.

For most projects external input is sought for developing the implementation portion of the TMDL. Most commonly, Soil and Water Conservation Districts and watershed groups are consulted, but permittees or other entities may also be asked for input in the development stage of the implementation plan, depending upon the issues in the watershed. While there is always room for improvement, Ohio EPA does not propose significant changes in the integration aspect over the next few years in terms of our internal coordination. But it should be noted that since the Supreme Court of Ohio determined that TMDLs are subject to the administrative rule making procedures[5], it is anticipated that the future process in Ohio for developing and finalizing TMDLs will include more opportunities for external stakeholders to participate, as well as provide an avenue for affected parties to appeal the final decision.

[5] On March 24, 2015, the Supreme Court of Ohio determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act. Ohio EPA must follow the rulemaking procedure in R. C. Chapter 119 before submitting a TMDL to U.S.EPA for its approval, and before the TMDL may be implemented in an NPDES permit."

Section

D

Framework for Reporting and Evaluation

This section describes the framework and basic elements for evaluating and reporting the water quality information in this report.

The 2016 Integrated Report (IR) continues Ohio's evolution to a fully-formed watershed basis for reporting on water quality conditions. For the past 20 years Ohio has maintained strong linkages between Clean Water Act (CWA) Section 305(b) reporting and Section 303(d) listing. Under the title *Water Resource Inventories*, Ohio prepared CWA Section 305(b) reports every two years since 1988 using a biologically based assessment methodology[1]. Subsequently, CWA Section 303(d) lists were compiled using the output of CWA Section 305(b) reporting in 1992, 1994, 1996 and 1998. In 2002, the first IR was produced, addressing the needs of both reporting requirements.

Reporting on Ohio's water resources continues to develop, including more data types and more refined methodologies. The basic framework for this report is built on four beneficial uses, as follows:

1. Aquatic Life: Analysis of the condition of aquatic life was the long-standing focus of reporting on water quality in Ohio and continues to provide a strong foundation. The 2016 methodology is unchanged from what was used in the 2014 IR. Additionally, as in the 2012 and 2014 IRs, a methodology for assessing the aquatic life condition of inland lakes is previewed for possible inclusion in the 2018 or 2020 report provided necessary rule revisions to the Ohio Water Quality Standards are promulgated.

2. Recreation: A methodology for using bacteria data to assess recreation suitability was developed for the 2002 report and refined in 2004, remaining essentially the same for 2006 and 2008. In 2010, the recreation use analysis changed significantly to a new indicator, a new water quality standard, and a data grouping procedure similar to that used for aquatic life. The methodology has not changed for the 2016 report.

3. Human Health: A methodology for comparing fish tissue contaminant data to human health criteria via fish consumption advisories was included in the 2004 report. That methodology has been refined in each subsequent report to align more directly with the human health water quality criteria. The methodology was changed in the 2010 report to be consistent with the methodology described in U.S. EPA's 2009 guidance for implementing the methylmercury water quality criterion. The methodology has not changed for the 2016 report.

4. Public Drinking Water: The assessment methodology for the public drinking water supply (PDWS) beneficial use was first presented in the 2006 report. Updates to the methodology have been presented in subsequent reports. For the 2014 report, it was revised to include a new core indicator based on algae and associated cyanotoxins, and assessment units listed as impaired for algae. The methodology has not changed for the 2016 report.

The methodology for assessing support of each beneficial use is described in more detail in Sections E through H.

[1] In 1990, the linkage of fish and macroinvertebrate community index scores and attainment of aquatic life use designations was established in Ohio's Water Quality Standards (OAC 3745-1).

D1. Assessment Units

The 2016 IR continues the watershed orientation outlined in previous reports; the assessment units have not changed significantly from the 2010 report. Throughout this report, references are made to large rivers and watersheds as assessment units defined for 303(d) listing purposes. Data from individual sampling locations in an assessment unit are accumulated and analyzed; summary information and statewide statistics are provided in this report. The three types of assessment units (AUs) are:

1. Watershed Assessment Units (WAUs) – 1,538 watersheds that align with the 12-digit hydrologic unit code (HUC) system. Ohio HUC numbers are lowest in the northwest corner of the state, proceeding approximately clockwise around the state. The first two digits of Ohio numbers are either 04 (draining to Lake Erie) or 05 (draining to the Ohio River).

2. Large River Assessment Units (LRAUs) – 38 segments in the 23 rivers that drain more than 500 square miles; the length of each river included is from the mouth of each river upstream to the point where the drainage area reaches approximately 500 square miles.

3. Lake Erie Assessment Units (LEAUs) – for three shoreline areas of the lake: western (Ohio/Michigan state line to eastern terminus of Sandusky Bay opening to Lake Erie); central (eastern terminus of Sandusky Bay opening to Lake Erie to Ohio/Pennsylvania state line); and Lake Erie islands (including South Bass Island, Middle Bass Island, North Bass Island, Kelleys Island, West Sister Island and other small islands) extending 100 meters from the shore. These assessment units also include Public Drinking Water Supply intake zones (500-yard radius around intakes) associated with the nearest shoreline unit even if they are greater than 100 meters from the shore.

Ohio River assessment units have been defined by the Ohio River Valley Water Sanitation Commission (ORSANCO). See Section D2 for additional discussion of ORSANCO's work.

It is important to remember that the information presented here is a summary. All of the underlying data observations are available and can be used for more detailed analysis of water resource conditions on a more localized, in-depth scale. Much of the information is available in watershed reports available at http://www.epa.ohio.gov/dsw/document_index/psdindx.aspx. Total Maximum Daily Load (TMDL) reports, available at http://www.epa.ohio.gov/dsw/tmdl/index.aspx, are another source of more in-depth analyses. Water chemistry data collected by Ohio EPA's Division of Surface Water (DSW) is regularly reviewed and uploaded to the national STORET Data Warehouse. Approved data collected from 2005 to present can be queried and downloaded from STORET via the Water Quality Portal at http://www.waterqualitydata.us/. Ohio EPA data can be found under the organization ID "21OHIO_WQX". Biological data is available from Ohio EPA upon request but is not currently available through the Water Quality Portal or STORET.

Ohio's large rivers, defined for this report as draining greater than 500 square miles, are illustrated in Figure D-1. Ohio's watershed units are shown in Figure D-2.

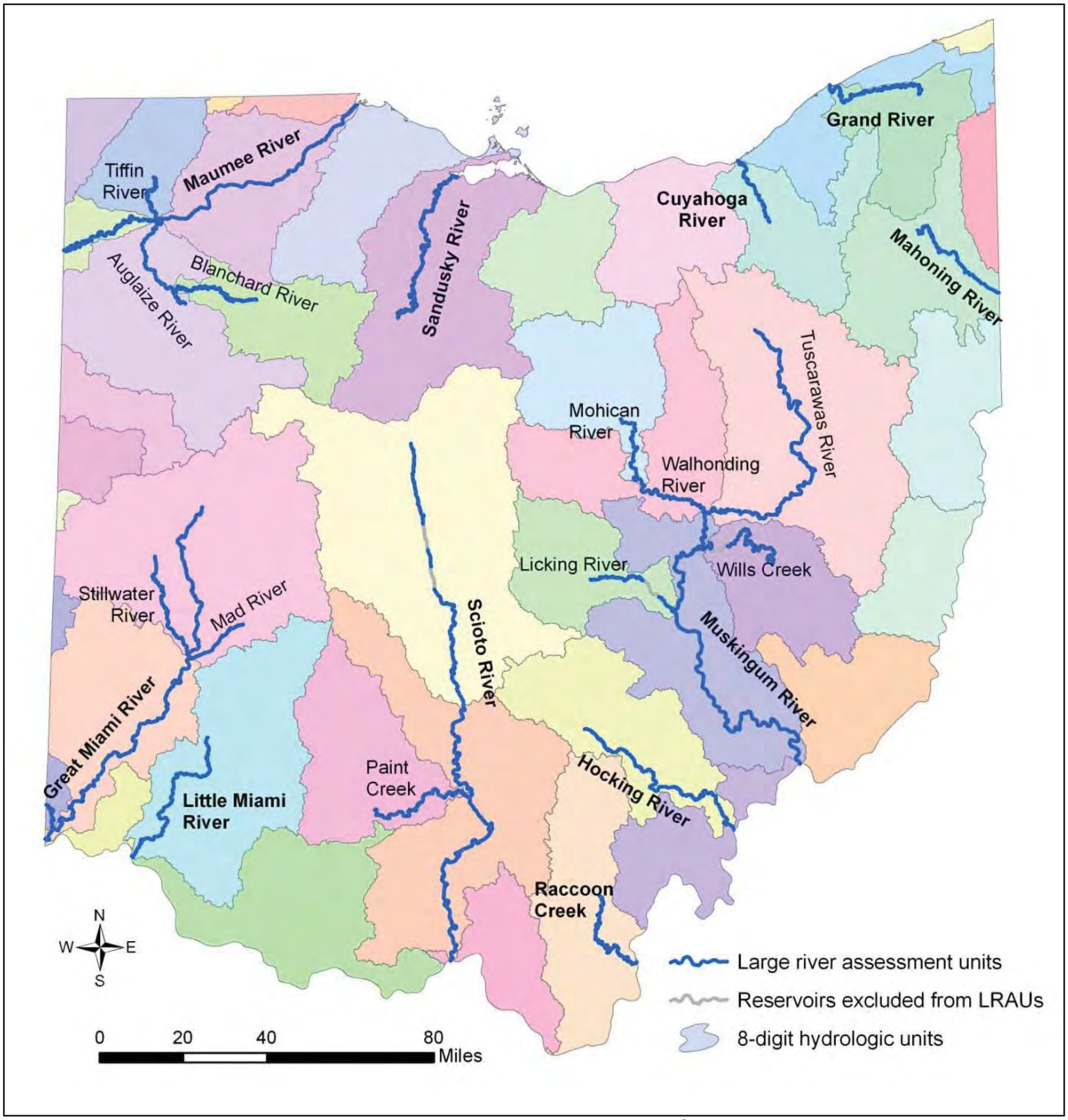


Figure D-1. Ohio's large rivers (rivers with drainages greater than 500 mi^2) and their watersheds.
Note: Bolded river names indicate the primary mainstem of that drainage basin.

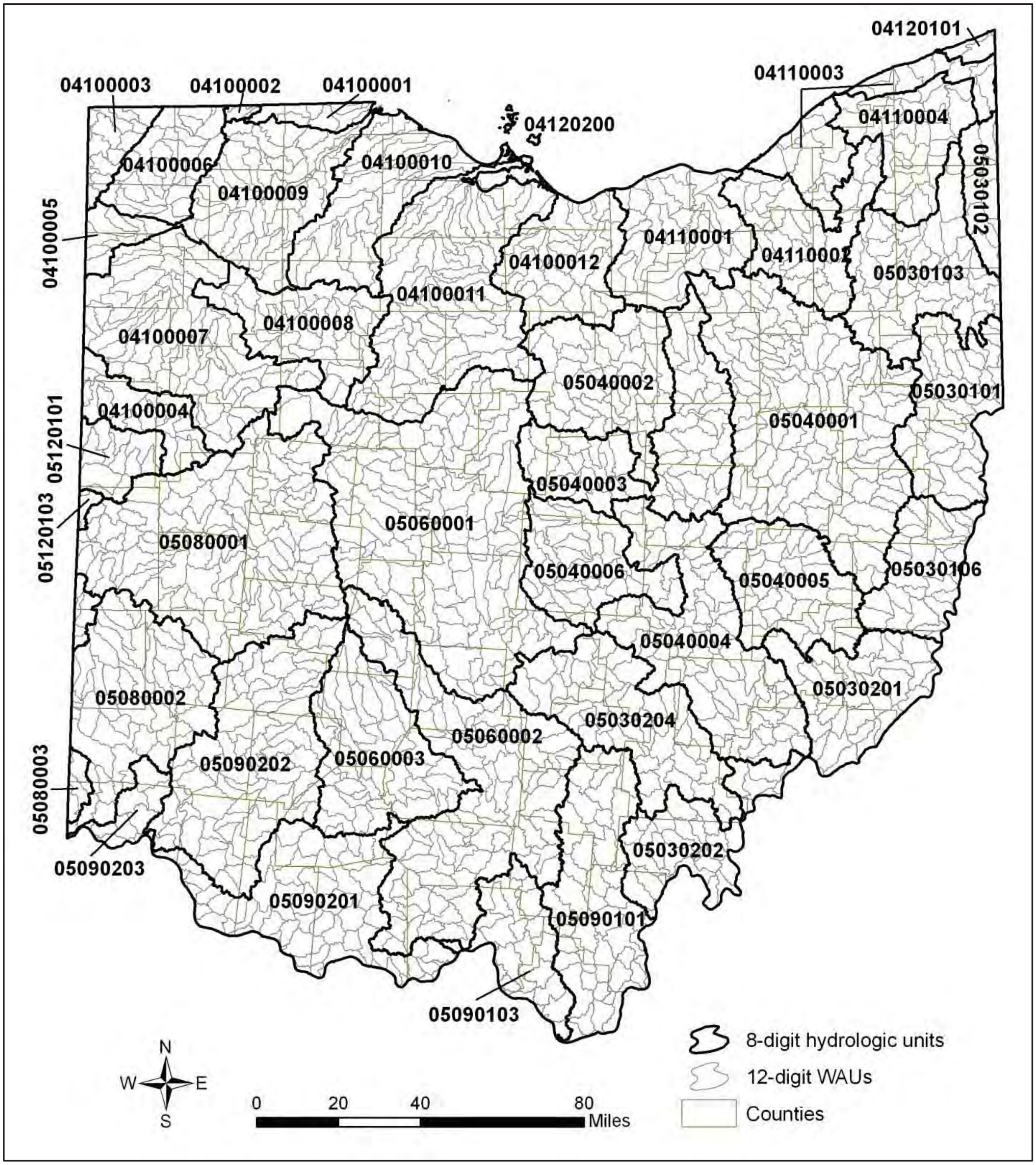


Figure D-2. Ohio's 12-digit WAUs (gray lines) and 8-digit hydrologic units (heavy black lines).

D2. Evaluation of the Ohio River

Since 1948, the Ohio River Valley Water Sanitation Commission (ORSANCO) and its member states have cooperated to improve water quality in the Ohio River Basin so that the river and its tributaries can be used for drinking water, industrial supplies and recreational purposes; and can support healthy and diverse aquatic communities. ORSANCO operates monitoring programs to check for pollutants and toxins that may interfere with specific uses of the river and conducts special studies to address emerging water quality issues. ORSANCO was established on June 30, 1948, to control and abate pollution in the Ohio River Basin. ORSANCO is an interstate commission representing eight states and the federal government. Member states include Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia. ORSANCO operates programs to improve water quality in the Ohio River and its tributaries including: setting wastewater discharge standards; performing biological assessments; monitoring for the chemical and physical properties of the waterways; and conducting special surveys and studies. ORSANCO also coordinates emergency response activities for spills or accidental discharges to the river and promotes public participation in the programs such as the Ohio River Sweep, RiverWatchers Volunteer Monitoring Program and Friends of the Ohio.

As a member of the Commission, the state of Ohio supports ORSANCO activities, including monitoring of the Ohio River mainstem, by providing funding based on state population and miles of Ohio River shoreline. As such, monitoring activities on the Ohio River are coordinated and conducted by ORSANCO staff or its contractors. More information about ORSANCO and the Ohio River monitoring activities conducted through that organization can be found online at http://www.orsanco.org.

Ohio EPA participates in an ORSANCO workgroup to promote consistency in 305(b) reporting and 303(d) listing. The workgroup discussed and agreed upon methods to evaluate attainment/non-attainment of aquatic life, recreation and public water supply uses, as well as impairments based on sport fish consumption advisories. ORSANCO prepares the Section 305(b) report for the Ohio River and has indicated the impaired beneficial uses and segments of the Ohio River. Ohio EPA defers to the ORSANCO analysis and the list of impaired Ohio River segments found in *2014 Biennial Assessment of Ohio River Water Quality Conditions* (ORSANCO 2014). ORSANCO has completed its 2016 biennial assessment of Ohio River Water Quality Conditions, which can be found online at http://orsanco.org/biennial-assessment-of-ohio-river-water-quality-conditions-305b.

D3. Evaluation of Lake Erie

Lake Erie is bordered by four states and one Canadian province. As such, it has federal oversight by two sovereign nations. Unlike most other waters in Ohio, Lake Erie has a more complicated governance structure with a binational agreement (GLWQA) between the U.S. and Canada providing a framework to identify binational priorities and implement actions that improve water quality. For comparison, assessment and reporting on one of Ohio's other multi-state waters, the Ohio River, is conducted by ORSANCO, which, as stated above, is an interstate commission representing eight states and the federal government.

Ohio's assessment and impairment designation for Lake Erie has been the focus of considerable discussion between Ohio EPA, U.S. EPA and local stakeholders. In Ohio's 2014 Integrated Water Quality Report *Section I: Considerations for Future Lists*, Ohio proposed a new approach for Lake Erie with new assessment units and methodology for the nearshore and open waters. Ohio EPA initially planned to

adopt the new assessment units and methodology during a later IR cycle, anticipating that the GLWQA Annex 4 efforts would produce nutrient concentration targets or criteria for the open waters.

The GLWQA Annex 4 efforts so far have resulted in load reductions targets rather than in-lake nutrient concentration targets or criteria. For this and other reasons outlined in Section J3, Ohio does not intend to pursue development of the open water assessment units and methods at this time. Ohio EPA believes that assessment and listing of the open waters under the CWA should be led by U.S. EPA in consultation with the states and Ohio is willing to assist its federal partners with the development of appropriate monitoring and assessment protocols for the open waters. Federal leadership on the open water assessments will also facilitate coordination with the ongoing GLWQA Annex 4 efforts (U.S. EPA and Environmental Canada are federal co-leads). In the meantime, Ohio is actively working towards the nutrient reduction goals for Lake Erie recommended by the Annex 4 subcommittee (see Section J3 for more information).

To be clear, the three current Lake Erie shoreline units have been assessed and impairment determinations made for the aquatic life use, recreational use, and human health (fish contaminants) use for over 10 years. **In the 2014 IR, the Western Basin Shoreline Unit was listed as impaired for all four beneficial uses, including the public drinking water supply beneficial use for the first time.** Public drinking water supply intakes that are located in Lake Erie beyond 100 meters from the shore were associated with the nearest shoreline assessment units. An algae indicator assessment methodology was implemented for the first time in the 2014 report, based on the state drinking water thresholds for microcystins, saxitoxin, anatoxin-a and cylindrospermopsin. This association and application for assessment and listing has been clarified in response letters to U.S. EPA in 2015 and in this report. These impairment determinations were made based on numeric targets or standards and objective assessment methods for each use designation (see Sections E through H for more information about how impairment is determined for each use) in line with how assessments for large river and watershed units have been conducted for the last several report cycles.

For this 2016 IR, Ohio has continued to use the three Lake Erie shoreline assessment units with all four beneficial uses assessed and all Lake Erie public drinking water intakes associated with one of the three units, as shown in Figure D-3. The shoreline unit extends 100 meters from the actual shore. The 303(d) Prioritized List of Impaired Waters (Table L4) includes all three assessment units and shows that all three are now listed as impaired for aquatic life use, public drinking water use and human health (fish tissue). The western basin shoreline and central basin shoreline are also listed as impaired for recreation use by bacteria (*e. coli*).

D4. Ohio's Water Quality Standards Use Designations

Beneficial use designations describe existing or potential uses of water bodies. They take into consideration the use and value of water for public water supplies, protection and propagation of aquatic life, recreation in and on the water, agricultural, industrial and other purposes. Ohio EPA assigns beneficial use designations to water bodies in the state. There may be more than one use designation assigned to a water body. Examples of beneficial use designations include: public water supply, primary contact recreation, and numerous sub-categories of aquatic life uses. Table D-1 lists all of Ohio's water quality standards (WQS) designated uses and outlines how the use was evaluated for the Ohio 2016 IR.

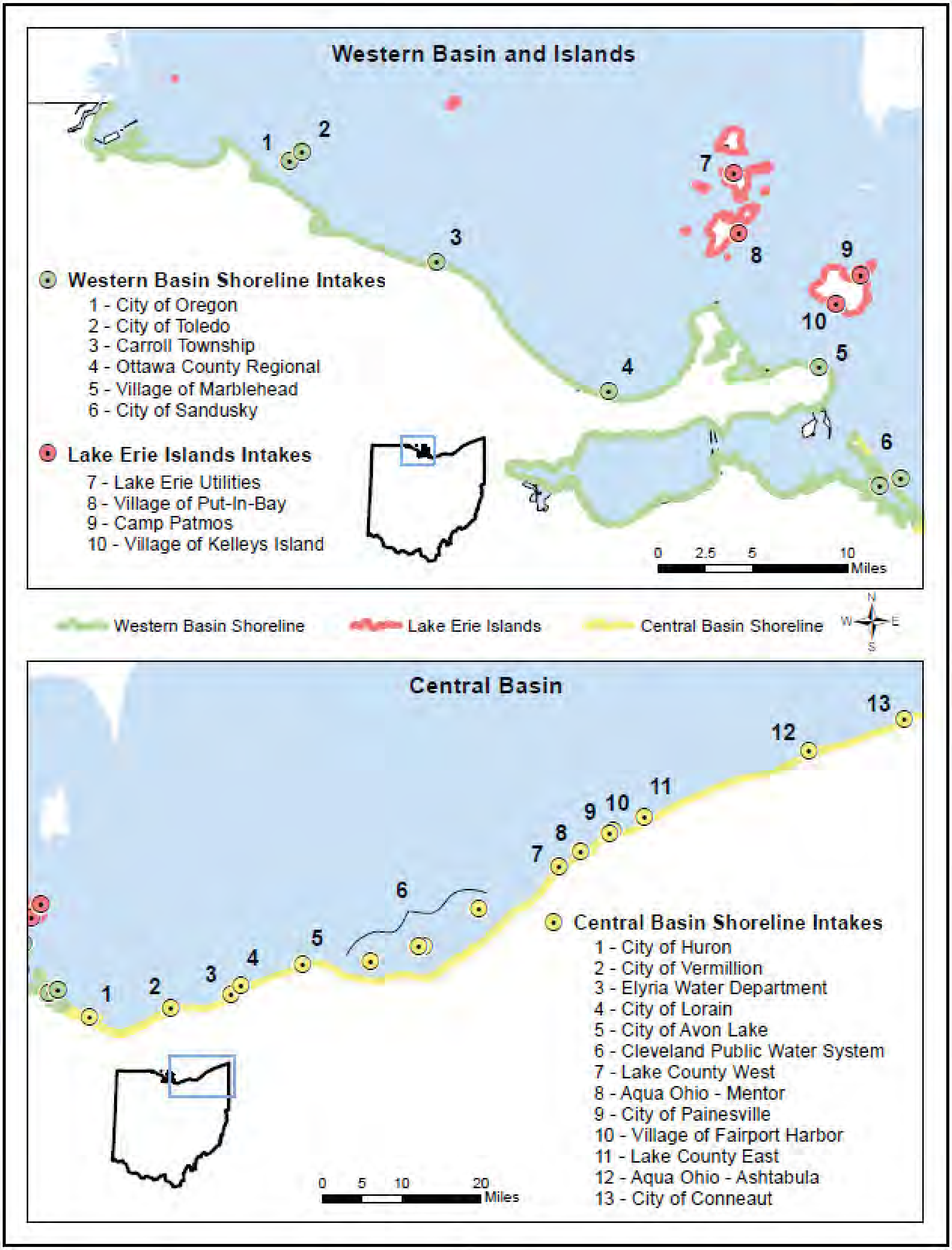


Figure D-3. Ohio's Lake Erie assessment units – western basin, islands and central basin shoreline with associated Public Water Supply intake zones.

Table D-1. Ohio water quality standards in the 2016 IR.

Beneficial Use Category	Key Attributes[2]	Evaluation status in the 2016 IR
Categories for the protection of aquatic life		
Coldwater habitat (CWH)	native cold water or cool water species; put-and-take trout stocking	Assessed on case by case basis
Seasonal salmonid habitat (SSH)	supports lake run steelhead trout fisheries	No direct assessment, streams assessed as EWH or WWH
Exceptional warmwater habitat (EWH)	unique and diverse assemblage of fish and invertebrates	64 percent of the WAUs and 98 percent of the LRAUs fully assessed using direct comparisons of fish and macroinvertebrate community index scores to the biocriteria in Ohio's WQS; sources and causes of impairment were assessed using biological indicators and water chemistry data.
Warmwater habitat (WWH)	typical assemblages of fish and invertebrates	
Modified warmwater habitat	tolerant assemblages of fish and macro- invertebrates; irretrievable condition precludes WWH	
Limited resource water	fish and macroinvertebrates severely limited by physical habitat or other irretrievable condition	Assessed on case by case basis
Categories for the protection of recreational activities		
Bathing Waters	Lake Erie (entire lake); for inland waters, bathing beach with lifeguard or bathhouse facility	Lake Erie public beaches fully evaluated; nine inland lakes evaluated
Primary Contact Recreation (PCR)	waters suitable for one or more full-body contact recreation activity such as wading and swimming; three classes are recognized, distinguished by relative potential frequency of use	45 percent of the WAUs, 45 percent of the LRAUs and 100 percent of beaches in LEAUs assessed using applicable PCR geometric mean *E. coli* criteria
Secondary Contact Recreation (SCR)	waters rarely used for recreation because of limited access; typically located in remote areas and of very shallow depth	Assessed as part of the WAU using applicable SCR geometric mean *E. coli* criteria
Categories for the protection of water supplies		
Public Water Supply	waters within 500 yards of all public water supply surface water intakes, publically owned lakes, waters used as emergency supplies	Sufficient data were available to assess 57 percent of the 123 AUs with PDWS use; assessed using chemical water quality data; only waters with active intakes were assessed
Agricultural Water Supply	water used, or potentially used, for livestock watering and/or irrigation	Not assessed
Industrial Water Supply	water used for industrial purposes	Not assessed

[2] Reasons for which a water body would be designated in the category.

D5. Sources of Existing and Readily Available Data

For two decades Ohio EPA has placed a high priority on collecting data to accurately measure the quality of Ohio's rivers and streams. Therefore, the Agency has a great deal of information and data to draw upon for the IR. The available data sets from Ohio EPA and external sources, including efforts used to obtain additional data, are also discussed below. The 2008 IR marked the first time that Ohio's credible data law was fully implemented in generating external data for consideration.

The "credible data law," enacted in 2003 (ORC 6111.50 to 6111.56), requires that the director of Ohio EPA adopt rules which would, among other things, do the following:

- establish a water quality monitoring program for the purpose of collecting credible data under the act; require qualified data collectors to follow plans pertaining to data collection; and require the submission of a certification that the data were collected in accordance with such a plan; and

- establish and maintain a computerized database or databases of all credible data in the director's possession and require each state agency in possession of surface water quality data to submit that data to the director.

Ohio EPA adopted rules in 2006, revised in 2011, to establish criteria for three levels of credible data for surface water quality monitoring and assessment and to establish the necessary training and experience for persons to submit credible data. Apart from a few exceptions, people collecting data and submitting it to Ohio EPA for consideration as credible data must have status as a qualified data collector (QDC). Only Level 3 data can be used for decisions about beneficial use assignment and attainment; water quality standards; listing and delisting (303(d) list); and TMDL calculations.

Ohio EPA solicited data from all Level 3 QDCs for the 2016 IR. The letter requesting data and the web site containing information about how to submit data are included in Section D5.1. Table D-2 summarizes the WQS uses evaluated in the 2016 IR, the basic types of data used, the period of record considered, the sources of data and the minimum amount of data needed to evaluate a water body. Specific methodologies used to assess attainment of the standards are described in more detail in Sections E through H.

Table D-3 summarizes the data Ohio EPA used in the 2016 IR. Ohio EPA's 2016 IR uses fish contaminant data to determine impairment using the human health based water quality criteria. Fish consumption advisories (FCAs) were not used in determining impairment status. However, the public should use the FCAs in determining the safety of consuming Ohio's sport fish.

The evaluation of bacteria, biological and water quality survey data was not changed from the approach used in the 2010 IR. Data collected by Ohio EPA and Level 3 QDCs were evaluated. The following QDCs submitted data or the data were available from readily obtained reports:

- Ohio Department of Natural Resources
- U.S. Geological Survey
- Northeast Ohio Regional Sewer District
- Midwest Biodiversity Institute/Center for Applied Bioassessment and Biocriteria

- Heidelberg College
- The Ohio State University
- Ohio Department of Health
- Cuyahoga County Board of Health
- EnviroScience, Inc.
- EA Science and Technology, Inc.
- Cleveland Metroparks

Table D-2. Data types used in the 2016 IR.

WQS Uses and Criteria Evaluated (basic rationale[3])	Type of Data Time Period	Source(s) of Data	Minimum Data Requirement
Human health, single route exposure via food chain accumulation and eating sport fish (criteria apply to all waters of the State)	Fish Tissue Contaminant Data 2005 to 2014	Fish Tissue Contaminant Database	Data collected within past 10 years. Two samples, each from trophic levels 3 and 4 in each WAU or inland lake.
Recreation uses and subclasses - evaluation based on a comparison of *E. coli* levels to applicable geometric mean *E. coli* criteria in the WQS. Lake Erie shoreline evaluated on the basis of frequency of advisories posted at beaches	*E. coli* counts 2011 to 2015 (May through October only)	Ohio Dept of Health Cuyahoga County Health Department Northeast Ohio Regional Sewer District (NEORSD)	Bathing Waters – One or more geometric mean *E. coli* values (inland lakes; *E. coli* data from one or more beaches (Lake Erie shoreline AUs); minimum of one geometric mean *E. coli* concentration per WAU or one site every ~5 to 7 river miles for LRAUs
Aquatic life (specific sub-categories), fish and macroinvertebrate community index scores compared to biocriteria in WQS[4]	Watershed scale biological and water quality surveys & other more targeted monitoring 2003 to 2014	ODNR U.S. Geological Survey NEORSD Midwest Biodiversity Institute Heidelberg College Ohio State University EnviroScience, Inc.	Fish and/or macroinvertebrate samples collected using methods cited in WQS[5]. Generally, 2 to 3 locations sampled per WAU (12-digit HUC).
Public drinking water supply (criteria apply within 500 yards of active drinking water intakes, all publically owned lakes, and all emergency water supplies)	Chemical water quality data 2010 to 2015	SDWIS (PWS compliance database) Syngenta Crop Protection, Inc. (Atrazine Monitoring Program)[6]	Data collected within past five years. Minimum of 10 samples with a few exceptions (noted in Section H).

[3] Additional explanation is provided in the text of Section D2.
[4] OAC 3745-1-07(A)(6) and Table 7-15
[5] OAC 3745-1-03(A)(5)
[6] These data were collected as part of an intensive monitoring program at community water systems required by the January 2003 Atrazine Interim Reregistration Eligibility Decision and subsequent Memorandum of Agreement between U.S. EPA and the atrazine registrants (including Syngenta Crop Protection, Inc.).

Table D-3. Description of data used in the 2016 IR from sources other than Ohio EPA.

<table>
<tr><th>Entity</th><th>Dates data were collected</th><th>Data description</th><th>Basis of qualification[7]</th></tr>
<tr><td colspan="4">Data Collected Before Credible Data Law (March 24, 2006)</td></tr>
<tr><td rowspan="3">Ohio Department of Natural Resources</td><td>1997 – 2005</td><td>Fish tissue</td><td rowspan="3"></td></tr>
<tr><td rowspan="2">2003 – 2005</td><td>Biology (fish only)</td></tr>
<tr><td>Physical habitat</td></tr>
<tr><td>U.S. Geological Survey</td><td>2003</td><td>Biology (macroinvertebrates only)</td><td></td></tr>
<tr><td>Northeast Ohio Regional Sewer District</td><td>2005</td><td>Fish tissue</td><td></td></tr>
<tr><td rowspan="3">Midwest Biodiversity Institute/Center for Applied Bio-assessment and Biocriteria</td><td rowspan="3">2003 – 2004</td><td>Biology</td><td rowspan="3"></td></tr>
<tr><td>Physical habitat</td></tr>
<tr><td>Chemistry</td></tr>
<tr><td rowspan="2">Heidelberg College</td><td>2004</td><td>Biology (macroinvertebrates only)</td><td rowspan="2"></td></tr>
<tr><td>Jan 2002 – Feb 2006</td><td>Chemistry</td></tr>
<tr><td colspan="4">Data Collected After Credible Data Law (March 24, 2006)</td></tr>
<tr><td>NPDES permittees</td><td>2011 – 2015 (May – Oct only)</td><td>Bacteria</td><td>Data credible – submittal pursuant to permit</td></tr>
<tr><td>Ohio Department of Health (ODH)</td><td>2011 – 2015 (May – Oct only)</td><td>Bacteria</td><td>State agency</td></tr>
<tr><td>Cuyahoga County Health Department</td><td>2011 – 2015 (May – Oct only)</td><td>Bacteria</td><td>Level 3 qualified data collector (under ODH’s study plan)</td></tr>
<tr><td rowspan="3">Northeast Ohio Regional Sewer District</td><td>2011 – 2015 (May – Oct only)</td><td>Bacteria</td><td rowspan="3">Level 3 qualified data collector</td></tr>
<tr><td>Jul 2006 – Oct 2014</td><td>Physical habitat</td></tr>
<tr><td>2008</td><td>Fish tissue</td></tr>
<tr><td rowspan="3">Ohio Department of Natural Resources</td><td>Apr 2006 – Nov 2014</td><td>Fish tissue</td><td rowspan="3">State agency/Level 3 qualified data collector</td></tr>
<tr><td rowspan="2">Sep 2006 – Sep 2014</td><td>Biology (fish only)</td></tr>
<tr><td>Physical habitat</td></tr>
<tr><td>PWS compliance database (permittees)</td><td>Jan 2010 – Dec 2015</td><td>Chemistry</td><td>Data credible – submittal pursuant to permit</td></tr>
<tr><td>Syngenta Corp Protection, Inc.</td><td>Jan 2010 – Dec 2015</td><td>Chemistry</td><td>See footnote[8]</td></tr>
</table>

[7] Level 3 qualified data collector requirements are described in OAC Rule 3745-4-03(A)(4). Included above are qualified data collectors Ohio EPA has approved for stream habitat assessment, fish community biology, benthic macroinvertebrate biology and/or chemical water quality assessment.

[8] These data were collected as part of an intensive monitoring program at community water systems required by the Jan 2003 Atrazine Interim Reregistration Eligibility Decision and subsequent Memorandum of Agreement between U.S. EPA and the atrazine registrants (including Syngenta Crop Protection, Inc.).

Entity	Dates data were collected	Data description	Basis of qualification[7]
The Ohio State University	May – Oct 2006	Biology (macroinvertebrates only)	Level 3 qualified data collector
Midwest Biodiversity Institute/Center for Applied Bio-assessment and Biocriteria	Jul 2010 – Oct 2014	Biology Physical habitat	Level 3 qualified data collector
Enviroscience, Inc.	Sep – Nov 2011	Biology Physical habitat	Level 3 qualified data collector
Ohio Department of Transportation	Jun 2007 – Oct 2010	Biology (fish only) Physical habitat	State agency/Level 3 qualified data collector
Heidelberg College	Jun 2012 – Oct 2012	Biology (macroinvertebrates only)	Level 3 qualified data collector
EA Science and Technology, Inc.	Jul 2014 – Oct 2014	Biology	Level 3 qualified data collector
Cleveland Metroparks	Jun 2012 – Sep 2014	Biology (fish only)	Level 3 qualified data collector
Clermont County Office of Environmental Quality	May 2009 – Sep 2013	Chemistry (drinking water) Physical habitat Biology (macroinvertebrates only)	Level 3 qualified data collector

D6. Public Involvement in Compiling Ohio's Section 303(d) List of Impaired Waters

The public was involved in various ways in the development of the 2016 IR. Several means of public communication are discussed below.

Ohio EPA convened an advisory group that included representatives from the regulated community (e.g., industries, municipalities), environmental groups, consultants, citizens, state and federal agencies, farm organizations and development interests. The group, which included about 80 active participants, met from late 1998 to June 2000. One subgroup addressed listing issues. Their conclusions were as follows:

- monitoring and data quality are essential
- use outside data of highest quality
- endorse priorities of 1998 list
- increase attention to human health issues
- quantify "cost of inaction"
- more monitoring is needed
- data should be accessible and geographically referenced
- increased public involvement is needed
- current funding and resources are inadequate

The cost associated with implementing the advisory group's listing recommendations was $3.2 million annually; the cost for implementing all advisory group recommendations was $9.7 million annually. Ohio EPA used these estimates to seek additional monies, but ultimately was unsuccessful in competing with other state funding priorities. Ohio EPA has incorporated the "low cost" recommendations (the

first four listed above) and it continues to seek ways to address all of the group's recommendations.

Much of the data used in this report have been presented to the public in meetings and publications concerning individual watersheds. Data and assessments have also been available in previous 305(b), 303(d), and IRs. All of this information can be accessed from the following Internet web site: http://www.epa.ohio.gov/dsw/formspubs.aspx.

The draft 2016 303(d) list, contained in the draft 2016 IR, will be also available for public review and comment prior to submitting the final list and report to U.S. EPA.

D6.1 Solicitation for External Water Quality Data, 2016 IR Project (June 2, 2015)

A memorandum soliciting level 3 qualified data was mailed in June 2015 to all Level 3 qualified data collectors. The memorandum is displayed below.

Date June 2, 2015

To Interested Parties: Stream Monitoring Personnel

Re Solicitation of Water Quality Data, 2016 Integrated Report
(No action is required on your part - submission of data is voluntary)

Ohio EPA is asking for chemical, biological and/or physical data you may wish to submit for consideration as the Agency prepares its 2016 Integrated Report. Both the state and federal governments have an interest in utilizing all available data to make informed decisions about managing Ohio's aquatic resources. Ohio EPA is only able to use data from a limited number of external sources, including Level 3 certified data collectors and NPDES discharge permit holders[2].

At this time, the Ohio EPA Division of Surface Water (DSW) is soliciting readily available data for use in the 2016 Integrated Report. The report, due to U.S. EPA on April 1, 2016, fulfills the State's reporting obligations under Sections 305(b) and 303(d) of the Clean Water Act. Information is available
at http://www.epa.ohio.gov/dsw/tmdl/OhioIntegratedReport.aspx.

Credible Data Law

In 2003 a new law was enacted in Ohio dealing with sources of data external to Ohio EPA. The "credible data law," as it is known (ORC 6111.50 to 6111.56), requires that the director of Ohio EPA adopt rules which would, among other things, do the following:

- establish a water quality monitoring program for the purpose of collecting credible data under the act, require qualified data collectors to follow plans pertaining to data collection, and require the submission of a certification that the data were collected in accordance with such a plan; and

- establish and maintain a computerized database or databases of all credible data in the director's possession, and require each state agency in possession of surface water quality data to submit them to the director.

The director has adopted rules (OAC 3745-4-01 through 06), effective March 2006, that delineate these requirements.

In addition, the law explicitly established that external data found compliant with the specifications for "Level 3 credible data," which generally means data from a Level 3 Qualified Data Collector, can be used for certain regulatory and reporting purposes, such as the Section 303(d) list.

[2] It is unnecessary to resubmit data that have already been submitted to the Division of Surface Water.

According to the Ohio EPA administrative rules, you may meet the qualifications of a "Level 3 Qualified Data Collector" in one or more areas of water quality data. Therefore, in pursuit of all readily available data for use in the state's reporting documents, the Agency is requesting your voluntary participation by submitting any recent water quality data that you have on Ohio's waters (e.g., lakes, rivers, streams and wetlands) that you are qualified to collect. Data submission deadlines are dependent on the type of data:

- Biological, physical, and chemical = July 15, 2015
- Bacteria = September 15, 2015

More information about the specific types of data being requested by Ohio EPA, and how to submit such data, can be found at: http://www.epa.ohio.gov/dsw/tmdl/2016IntReport/2016CallForData.aspx

D6.1.1 Web Page with Instructions for Submitting Level 3 Credible Data

For organizations interested in submitting data to Ohio EPA, a web page was established with instructions on what qualified data to be submitted and how to do so. The web site content is displayed below.

2016 Integrated Water Quality Monitoring and Assessment Report - Call for Level 3 Credible Data

Information about submitting Level 3 credible data to Ohio EPA is organized as outlined below. More information about the Integrated Report is on the Ohio Integrated Water Quality Monitoring and Assessment Report page.

- *What kind of data does Ohio EPA want?*
  - *Microbiological Data*
  - *Biological and Physical Data*
  - *Chemical Water Quality Data*
- *Do I have Level 3 data?*
- *Have I already given Ohio EPA my data?*
- *What will be needed in addition to data?*
  - *Microbiological Data Requirements*
  - *Biological, Chemical and Physical Data Requirements*
- *How do I send the data?*
- *To whom do I send the data?*

To access the information, click on the relevant link below.

What kind of data does Ohio EPA want?

Ohio EPA is asking for biological, physical and/or chemical data you may wish to submit for consideration as the Agency prepares its 2016 Integrated Report. Both the state and federal governments have an interest in utilizing all available data to make informed decisions about managing Ohio's aquatic resources. Ohio EPA is soliciting data primarily from NPDES major permit holders, Level 3 Qualified Data Collectors and others that may be in possession of Level 3 credible data. The data can be of various types (bacteria, biological, physical, and chemical water quality

data) and must have been collected during the following time frame:

- *Bacteria = 2013 – 2015 (recreation season)*
- *Biological, physical, and chemical = 2013 – 2014*

Microbiological Data

- *Ohio EPA measures recreation use attainment by comparing the level of indicator bacteria present in ambient water samples against the bacteria criteria contained in rule 3745-1-07 of Ohio's water quality standards. These indicator bacteria serve as predictors for the presence of enteric pathogens in the water that can cause a variety of illnesses. The type of indicator bacteria that Ohio EPA is utilizing in the 2016 Integrated Report is* ***E. coli****.*

- *Data collected by NPDES discharge permit holders at ambient stream sites upstream and downstream of discharge locations and reported in discharge monitoring reports (DMRs) will be extracted from the SWIMS database.* ***It is unnecessary to resubmit data already submitted into SWIMS.*** *However, if bacteria data were collected at additional ambient stations and not reported through SWIMS, permit holders may voluntarily submit this data to the Agency. Data must have been collected between May 1, 2013 and September 15, 2015 and must meet the basic terms of acceptability found in the requirements listed below.*

Biological and Physical Data

- *Ohio EPA measures aquatic life use attainment in Ohio streams and rivers by comparing indices generated from fish and aquatic macroinvertebrate data against the biological criteria contained in Ohio's water quality standards, OAC 3745-1-07, Table 7-15. Field collection and data analysis methodologies for fish and macroinvertebrate community assessments are strictly adhered to and must follow procedures as outlined in the Ohio EPA biological criteria manuals.*

- *Chemical water quality data collected in conjunction with biological data is of interest to Ohio EPA. Data should follow the parameters discussed below.*

Chemical Water Quality Data

- *Ohio EPA primarily uses sampling methods described in the "Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices, 2009 Revision". Sample collection and analysis method references are listed in paragraph (C) of OAC 3745-4-06. Ohio EPA is interested in other chemical water quality data collected and analyzed by these methods or others of similar quality control/quality assurance rigor.*

Do I have Level 3 data?

In 2003, a new law was enacted in Ohio dealing with external sources of data. The "credible data law," as it is known (ORC 6111.50 to 6111.56), requires the director of Ohio EPA to adopt rules that would, among other things:

- *establish a water quality monitoring program for the purpose of collecting credible data under the act, require qualified data collectors to follow plans pertaining to data collection, and require the submission of a certification that the data were collected in accordance with such a plan; and*
- *establish and maintain a computerized database or databases of all credible data in the director's possession, and require each state agency in possession of surface water quality data to submit them to the director.*

The director has adopted rules (OAC 3745-4-01 to 06), effective March 2006, to accomplish these requirements.

In addition, the law explicitly established that external data found compliant with the specifications for "Level 3 credible data," which generally means data from a Level 3 Qualified Data Collector, can be used for certain regulatory and reporting purposes, such as the Section 303(d) list of Ohio's impaired waters.

Have I already given Ohio EPA my data?

External data Ohio EPA has received and may use for 305(b)/303(d) reporting:

Entity	Dates Data Were Collected	Data Description	Basis of Qualification[1]
Data Collected Before Credible Data Law (March 24, 2006)			
NPDES permittees	2002 – 2005 (May – Oct only)	Bacteria	
Ohio Department of Health (ODH)	2002 – 2005 (May – Oct only)	Bacteria	
Cuyahoga County Health Department	2002 – 2005 (May – Oct only)	Bacteria	
Northeast Ohio Regional Sewer District	2002 – 2005 (May – Oct only)	Bacteria	
Lake County General Health District	2002 – 2005 (May – Oct only)	Bacteria	
Ohio Department of Natural Resources	1997 – 2005	Fish tissue	
	2001 – 2005	Biology (fish only)	
		Physical habitat	
Ohio Northern University	1997	Biology	
Ohio University (Athens)	1995	Biology	
U.S. Geological Survey	2003	Biology (macroinvertebrates only)	
Northeast Ohio Regional Sewer District	2001	Biology (macroinvertebrates only)	
	2005	Fish Tissue	
Midwest Biodiversity Inst./ Ctr for Applied	2001 – 2004	Biology	
		Physical habitat	

Entity	Dates Data Were Collected	Data Description	Basis of Qualification[1]
Bio-assessment & Biocriteria		Chemistry	
Heidelberg College	2004	Biology (macroinvertebrates only)	
	Jan 2002 – Feb 2006	Chemistry	
PWS compliance database (permittees)	Jan 2002 – Feb 2006	Chemistry	
Syngenta Crop Protection, Inc.	Jan 2002 – Feb 2006	Chemistry	
Data Collected After Credible Data Law (March 24, 2006)			
NPDES permittees	2009 – 2010 (May - Oct only)	Bacteria	Data credible - submittal pursuant to permit
Ohio Department of Health (ODH)	2006 – 2010 (May - Oct only)	Bacteria	State Agency
Cuyahoga County Health Department	2006 – 2010 (May – Oct only)	Bacteria	Level 3 qualified data collectors (under ODH's study plan)
Northeast Ohio Regional Sewer District	2006 – 2010 (May – Oct only)	Bacteria	Level 3 qualified data collectors
	July 2006 – Oct 2014	Biology	
		Physical habitat	
	2007	Fish tissue	
Ohio Department of Natural Resources	April 2006 – Nov 2010	Fish Tissue	State Agency/Level 3 qualified data collectors
	Sept 2006 – Oct 2014	Biology (fish only)	
		Physical habitat	
PWS compliance database (permittees)	March 2006 – Dec 2010	Chemistry	Data credible - submittal pursuant to permit
Syngenta Crop Protection, Inc.[2]	March 2006 – Dec 2010	Chemistry	See footnote[2]
The Ohio State University	2006 (May – Oct only)	Biology (macroinvertebrates only)	Level 3 qualified data collectors
Midwest Biodiversity Inst./ Ctr for Applied Bio-assessment & Biocriteria	July 2010 – Oct 2014	Biology	Level 3 qualified data collectors
		Physical habitat	
EnviroScience, Inc.	Sept – Nov 2011	Biology	Level 3 qualified data collectors
		Physical habitat	
Ohio Department of Transportation	June 2007 – Oct 2010	Biology	State Agency/Level 3 qualified data collectors
		Physical habitat	
Heidelberg College	June 2012 – Oct 2012	Biology (macroinvertebrate ID only)	Level 3 qualified data collectors

Entity	*Dates Data Were Collected*	*Data Description*	*Basis of Qualification*[1]
EA Science and Technology, Inc.	*July 2014 – Oct 2014*	*Biology*	*Level 3 qualified data collectors*
		Physical habitat	
Cleveland Metroparks	*June 2012 – Sept 2014*	*Biology (fish only)*	*Level 3 qualified data collectors*
		Physical habitat	
Clermont County Office of Environmental Quality	*May 2009 – Sept 2013*	*Chemistry (drinking water)*	*Level 3 qualified data collectors*
		Biology (macroinvertebrates only)	
		Physical habitat	

[1] Level 3 Qualified Data Collector requirements are described in OAC Rule 3745-4-03(A)(4). Included above are Qualified Data Collectors Ohio EPA has approved for stream habitat assessment, fish community biology, benthic macroinvertebrate biology and/or chemical water quality assessment.

[2] These data were collected as part of an intensive monitoring program at community water systems required by the Jan 2003 Atrazine Interim Reregistration Eligibility Decision and subsequent Memorandum of Agreement between U.S. EPA and the atrazine registrants (including Syngenta Crop Production, Inc.).

What will be needed in addition to data?

Specific guidelines for submission of data are listed below. While these guidelines correspond to the regulations regarding credible data, they are not verbatim. To see the regulations, please go to OAC 3745-4-06.

Microbiological Data Requirements

An individual or organization who submits bacteria data to Ohio EPA for consideration in the 2016 Integrated Report shall attest to the validity of the data and adhere to the data quality specification listed here. The submission of data must cover the following:

- *Sampling and Test Methods, QA/QC Specifications: Sampling must be conducted in a manner consistent with procedures contained in Standard Methods for the Examination of Water and Wastewater or the "Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices, 2009".*

  Analytical testing must be conducted in accordance with U.S. EPA approved methods under 40 CFR 136.3. Acceptable references for methods for qualified data collectors are given in paragraph (C) of OAC 3745-4-06 and include Ohio EPA references, U.S. EPA references, and Standard Methods. Data submissions must include a description of the Quality Assurance/Quality Control (QA/QC) plans under which the bacteria sample analysis occurred. This should address topics such as sample handling and preservation, sample holding time, chain of custody, precision, accuracy, etc.

- *Description of Sampling Program: A brief description of the purpose of data collection and the sampling design considerations should be provided. Were specific sources of potential contamination under investigation? Were samples collected at fixed station locations? How*

often and under what kinds of environmental conditions were samples collected? Have the results been published in a report or the scientific literature?

- *Minimum Data Submission: Ohio EPA is requesting only bacteria data (E. coli) collected during the recreation season (May 1st to October 31st) for 2013-2014 and (May 1st to September 15th) for 2015. The following information must be included in the data submission in an electronic spreadsheet or database format:*

    - *Sample collection date*
    - *Sample collection method (with reference)*
    - *Sample site location including water body name, county, river mile (if known), latitude/longitude (decimal degrees or degrees, minutes, and seconds)*
    - *E. coli count*
    - *Identification of units associated with bacteria counts*
    - *Any applicable data qualifiers (as received from the lab, if applicable)*
    - *Contact name, address, telephone number, and e-mail address of the person submitting the data set*
    - *Identification of the laboratory performing the sample analysis*

Biological, Chemical and Physical Data Requirements

An individual or organization who submits biological, chemical and/or physical data to Ohio EPA for consideration in the 2016 Integrated Report shall attest to the validity of the data and adhere to the data quality specification listed here. The submission of data must cover the following:

- *Analytical and sampling procedures (examples):*
    - *Manual of Ohio EPA Surveillance Methods and Quality Assurance Practices, 2009*
    - *Habitat and biology sampling manuals*
    - *Only data that are consistent with these guidelines can be considered Level 3 data.*

- *Description of Sampling Program: A brief description of the purpose of data collection and the sampling design considerations should be provided. Were specific sources of potential contamination under investigation? Were samples collected at fixed station locations? How often and under what kinds of environmental conditions were samples collected? Have the results been published in a report or the scientific literature?*

    - *If the data have been or will be submitted as part of the Credible Data Program and there is an approved project study plan, this requirement is potentially waived, pending a successful data review that confirms study plan was adhered to as written.*

- *Minimum Data Submission: Ohio EPA is requesting biological, chemical and physical data collected from 2013-2014. The following information must be included in the data submission in an electronic spreadsheet or database format:*

    - *Sample collection date*
    - *Sample collection method (with reference)*

- *Sample site location including waterbody name, county, river mile (if known), latitude/longitude (decimal degrees or degrees, minutes and seconds)*
- *Type of data collected (fish, macroinvertebrate, chemical and physical parameters)*
- *Analytical and collection methodologies used (include references)*
- *Any applicable data qualifiers (as received from the lab, if applicable)*
- *Contact name, address, telephone number, and e-mail address of the person submitting the data set*
- *Identification of the laboratory performing the sample analysis (if applicable)*
- *Weather conditions, flow, and precipitation (all optional)*

How do I send the data?

If you have bacteria data collected from surface waters in Ohio, then Ohio EPA would be interested in discussing its possible use in the Integrated Report. Contact Chris Skalski at (614) 644-2144 or chris.skalski@epa.ohio.gov before preparing and submitting any information. The Agency's capacity to accept and utilize the data in preparation of the Integrated Report is dependent upon a variety of factors and the use of all data brought to our attention may not be possible. Data must have been collected after May 1, 2006 and must meet the basic acceptability specifications listed above. Data must be provided in electronic format such as STORET, Excel or Access.

Ohio EPA already has data from some credible data collectors, as listed in the table above. Additional data may be available and Ohio EPA is soliciting these data. If you have biological, chemical or physical data collected from surface waters in Ohio, then Ohio EPA would be interested in discussing its possible use in the Integrated Report. Contact Jeff DeShon at (614) 836-8780 or jeffrey.deshon@epa.ohio.gov before preparing and submitting any information. The Agency's capacity to accept and utilize the data in preparation of the Integrated Report is dependent upon a variety of factors and the use of all data brought to our attention may not be possible. Data must have been collected after January 1, 2013 and must meet the basic acceptability specifications listed above. Data must be provided in an electronic format such as STORET, Excel or Access.

To whom do I send the data?

Submit microbiological data and supporting information listed above by September 15, 2015 to Chris Skalski, chris.skalski@epa.ohio.gov, Ohio EPA/DSW, P.O. Box 1049, Columbus, Ohio 43216-1049.

Submit biological, physical, and chemical water quality data and supporting information listed above by July 15, 2015, to Jeff DeShon, jeffrey.deshon@epa.ohio.gov, Ohio EPA/Groveport Field Office, 4675 Homer-Ohio Lane, Groveport, Ohio 43125.

D6.2 Web Page Announcing 2016 Integrated Report Preparation

As shown below, Ohio EPA announced the preparation and anticipated schedule[9] of the 2016 Integrated Report on its website (http://www.epa.ohio.gov/dsw/tmdl/OhioIntegratedReport.aspx).

Preparation of 2016 Integrated Report is Underway

Ohio EPA is preparing the 2016 Integrated Report, which fulfills the State's reporting obligations under Section 305(b) (33 U.S.C. 1315) and Section 303(d) (33 U.S.C. 1313) of the Federal Clean Water Act. The report will indicate the general condition of Ohio's waters and list those waters that are currently impaired and may require Total Maximum Daily Load (TMDL) development in order to meet water quality standards.

When will the report be completed?

Major project milestones and expected dates for completion are:

Refine methodologies / compile data	June - October 2015
External Level 3 credible data are due to Ohio EPA	July 15, 2015
Prepare list / internal review	October - December 2015
Public notice draft 303(d) list	December 2015 – January 2016
Respond to comments / prepare final list	February - March 2016
Submit to U.S. EPA Region V for approval	April 1, 2016

Please continue to check this Web site for updates.

[9] Due to a variety of factors, the 2016 Integrated Report did not follow the originally anticipated schedule.

D6.3 Notice of Availability and Request for Comments CWA Section 303(d) TMDL Priority List for 2016

Public Notice Date: July 29, 2016

OHIO ENVIRONMENTAL PROTECTION AGENCY PUBLIC NOTICE

NOTICE OF AVAILABILITY and REQUEST FOR COMMENTS Federal Water Pollution Control Act Section 303(d) TMDL PRIORITY LIST FOR 2016

Public notice is hereby given that the Ohio Environmental Protection Agency (Ohio EPA) Division of Surface Water (DSW) is providing for public review and comment the Total Maximum Daily Load (TMDL) priority list for 2016 as required by Section 303(d) of the Federal Water Pollution Control Act (a.k.a., Clean Water Act), 33 U.S.C. Section 1313(d). The list indicates the waters of Ohio that are currently impaired and may require TMDL development in order to meet water quality standards. The list is contained within the *2016 Integrated Water Quality Monitoring and Assessment Report* (Section L4), which, in accordance with federal guidance, satisfies the Clean Water Act requirements for both Section 305(b) water quality reports and Section 303(d) lists. The report describes the procedures that Ohio EPA used to develop the list and indicates which areas have been selected for TMDL development during federal fiscal years 2016 through 2018.

Ohio EPA will present information about the list through a webinar on August 16. 2016, at 2:00 pm. The webinar may be viewed at Ohio EPA's Central Office, Conference Room B, 50 West Town Street, Suite 700, Columbus, Ohio 43215 or by registering and joining online at: https://ohioepa.webex.com/mw3100/mywebex/default.do?siteurl=ohioepa&service=6

All interested persons wishing to submit comments on the list for Ohio EPA's consideration may do so by email to dsw.webmail@epa.ohio.gov or in writing to Ohio EPA, Division of Surface Water, P.O. Box 1049, Columbus, Ohio 43216-1049 Attn: 303(d) Comments, by the close of business, August 29, 2016. Comments received after this date may be considered as time and circumstances allow.

After reviewing the comments, Ohio EPA will submit a final document to the United States Environmental Protection Agency (U.S. EPA) for approval.

The report is available for review on Ohio EPA's Division of Surface Water website at http://epa.ohio.gov/dsw/tmdl/OhioIntegratedReport.aspx. To arrange to inspect Agency files or records pertaining to the document, please contact Richard Bouder at (614) 644-2782. To request notice of when Ohio EPA submits the document to U.S. EPA, please contact the e-mail address above or call Rahel Babb at (614) 728-2384.

D7. Public Comments and Responses to Comments on Draft Report

The draft Ohio 2016 Integrated Water Quality Monitoring and Assessment Report (a.k.a., Integrated Report or IR) was available for public review from July 29, 2016, through August 29, 2016.

Twenty-three sets of public comments were received on the draft report during that time frame, as follows:

Name	Organization	Date Received
Susan Matz, Coordinator Mike Ferner, Coordinator	Advocates for a Clean Lake Erie	8/25/2016
Molly Flanagan, Vice President	Alliance for the Great Lakes	8/29/2016
Robert Wolas, Executive Secretary	Associated Yacht Clubs	8/28/2016
Kimberly Kaufman, Executive Director	Black Swamp Bird Observatory	8/25/2016
Melissa M. Purpura, City of Oregon Law Director John Borrell, Assistant Lucas County Prosecutor	City of Oregon and Lucas County	8/29/2016
Various[10]	Coalition of Environmental Organizations	8/29/2016
Laura Fay	Friends of Lower Olentangy River Watershed	8/19/2016
Sandy Bihn, Vice President/Lake Erie Waterkeeper	Lake Erie Improvement Association and Lake Erie Waterkeeper, Inc.	8/29/2016
Gail Hesse	National Wildlife Federation	8/29/2016
Chad Kemp, President Adam Graham, President	Ohio Corn & Wheat Growers Association and Ohio Soybean Association	8/29/2016
Vicki A. Askins	Ohio Environmental Stewardship Alliance	8/25/2016
Larry M. Antosch, Ph.D., Senior Director, Policy Development and Environmental Policy	Ohio Farm Bureau Federation	8/29/2016
Dr. Gregory Arko	private citizen	8/25/2016
Raymond Gajkowski	private citizen	8/25/2016

[10] The Coalition of Environmental Organizations consists of the following groups: Adam Rissien, Clean Water Director, Ohio Environmental Council; Molly M. Flanagan, Vice President, Policy, Alliance for the Great Lakes; Jill Ryan, Executive Director, Freshwater Future; Jennifer Miller, Director; Ohio Chapter of the Sierra Club; and Jessica Dexter, Staff Attorney, Environmental Law & Policy Center

Tahree Lane	private citizen	8/29/2016
Keleen McDevitt	private citizen	8/29/2016
Marjorie Mulcahy	private citizen	8/29/2016
Annette Shine	private citizen	8/29/2016
Anthony Szilagye	private citizen	8/29/2016
Sue Terrill	private citizen	8/26/2016
Claire Tinkerhess	private citizen	8/26/2016
Patrick E. Wright	private citizen	8/29/2016
Edward M Yandek	private citizen	8/25/2016

Comments are grouped by general topic. Some of the comments are expressed verbatim. In instances where the same or similar comment was made by two or more individuals/organizations, the comments were summarized and a collective response was prepared. Please note that page number references to the draft report may not correspond to the same page numbers in the final report. **Furthermore, responses were only prepared for comments that pertained to the 303(d) and/or the data that supports the list; other comments were taken into consideration, but may not be acknowledged in the text below.**

Complete copies of the comments are included at the end of this section.

Lake Erie Assessment and Impairment Decision Comments

Summarized comment 1: Ohio EPA should list the open waters of Lake Erie as impaired. It should follow the assessment protocols described in the 2014 Integrated Report and use the narrative criteria in OAC 3745-1-04(E) as a basis for an impairment determination. A determination of impairment would trigger a basin-wide TMDL in conjunction with Indiana and Michigan (and to the extent possible, Ontario) that would target both point and non-point nutrients responsible for the harmful algal blooms.

The state's claim that there is a lack of data to support a determination of impairment is unfounded since there seems to be an abundancy of data available through park employees, academic institutions, private citizens and federal agencies such as NASA and U.S. EPA's Great Lakes National Program office. In particular, Ohio should address data on Lake Erie's phosphorus and algae conditions summarized in the May 2015 report "Recommended Phosphorus Loading Targets for Lake Erie" developed under the Great Lakes Water Quality Agreement.

Ohio EPA's failure to either consider the narrative criteria in its assessment protocols or to analyze credible data according to a specific methodology in order to make an impairment determination for the open waters may constitute a violation of the Clean Water Act.

Response 1: Ohio EPA is not opposed to making impairment designations, evidenced by those already done in Lake Erie, but only when a science based process for designation and de-listing is available. We simply do not believe that the tools and measures are available yet to do so in a manner that is consistent, defendable and appropriate, beyond the shoreline and drinking water in-takes. We would certainly consider including more assessments and possible listings in our 2018 report if there is

adequate progress on developing consistent standards/action levels.

As it is, Ohio does not currently have an assessment methodology for determining the aquatic life use status of the open waters of Lake Erie based on the narrative standard defined in the Ohio Water Quality Standards. Our resources to date have been focused on developing rules and methods for interpreting that standard for rivers, streams and shorelines and we have routinely assessed and listed those for several years now. Most recently, our focus was on developing and implementing a method to assess the public drinking water supply (PDWS) use related to harmful algal blooms, which we have included for Lake Erie as well as other waters.

It should also be noted that the resources to conduct an assessment of the open waters of the lake are significant. There are safety issues, training requirements and high equipment costs related to collecting the data, to mention just a few concerns. And while we recognize that data are collected by NOAA and U.S. EPA, for example, it does not necessarily meet our needs (in terms of parameters, frequency and locations) for conducting an assessment of our water quality standards and use designations using our typical methods.

Because of the multi-jurisdictional in nature of Lake Erie, not only multi-state, but bi-national, Ohio EPA feels that the nutrient and algae issues in Lake Erie are best addressed through a formalized partnership with all the parties involved and should be handled in a consistent, uniform manner, starting with the assessment and listing process. The CWA section 118(c)(2)(A) says that by 1991, that the Great Lakes National Program Office (GLNPO) shall specify numerical limits on pollutants in ambient Great Lakes waters to protect human health, aquatic life and wildlife and shall provide guidance to the Great Lakes States on minimum water quality standards, antidegradation policies and implementation procedures for the Great Lakes System. To date GLNPO has not proposed a nutrient water quality standard for the waters of Lake Erie. In addition, the International Joint Commission (IJC) has authority to develop recommendations for water quality improvements if requested by U.S. EPA or Environment Canada.

One or both of these entities should be engaged in setting assessment methods to provide uniform listing and de-listing criteria by all of the Lake Erie states as well as Ontario. Single state impairment designation is complicated and questionable since the algae is seasonal, transient, spatially and temporally unpredictable and variable in species make-up, toxicity and bio-accumulation, whether present throughout the lake's various jurisdictions or contained to specific areas. A common threshold and assessment method would provide consistency in how each state assesses and lists waters within their jurisdiction.

In the 2014 IR, Ohio did provide a planned approach for assessing impairment in the open waters. However, that plan was based on the expectation that the Great Lakes Water Quality Agreement Annex 4 task team would develop concentration thresholds for nutrients, chlorophyll-a or a related parameter which could be used to assess the open lake attainment of our narrative water quality standard - that did not happen. Instead, the recommendations are to focus on reducing loads from the tributaries, which is what we have been doing.

To help with consistency, clarity and to provide a path forward that would benefit us all, Ohio suggested the following to U.S. EPA in a letter dated September 30, 2016;

1. U.S. EPA should finalize the recreation standard for algal toxins (microcystin), or at a minimum a threshold that could be used to consistently interpret narrative water quality standards. Once

that level is established, it would provide Ohio and other states with at least one common parameter and value to use for assessing and listing the open waters for harmful algal blooms.

2. Ohio in collaboration with U.S. EPA will explore one of the existing processes (GLNPO or IJC) to facilitate a multi-state and Ontario discussion on establishing standards and methods to assess aquatic life use and other standards for use in assessing impairments in Lake Erie.
3. U.S. EPA should recognize and validate that any efforts which will ultimately remove the nutrient impairment from the shoreline and algae toxin impairment from the drinking water intakes will most likely address water quality issues resulting from excessive nutrients and algae in the open-waters. We are committed to addressing those impairments through Annex 4.

Summarized comment 2: It is inaccurate to associate the Toledo and Oregon drinking water intakes with the shoreline assessment units since these structures are clearly in the open waters.

Response 2: Ohio has not formally designated assessment units in Lake Erie beyond the current shoreline assessment units and the Lake Erie PDWS zones do not reside within an existing assessment unit. Since Ohio has standards, data and an assessment methodology for the PDWS beneficial use we felt it was important to include those assessments in the Integrated Report and instead of creating 28 separate assessment units for the Lake Erie intakes, we decided to simply associate the PDWS zones with the nearest Lake Erie Assessment Unit. It should be noted that many of the Lake Erie intakes and assessment zones are within or near the shoreline assessment units.

PDWS assessments are based on source water drawn directly from the intakes and therefore representative of the waters where the beneficial use applies.

Comment 3: One approach Ohio EPA could take is to reframe its Assessment Unit framework beyond the limitations of the shoreline geography and propose a new unit(s) that aligns with loading at the mouth of the Maumee River. Section G-6 of the Integrated Report defines lacustuary, the zone where Lake Erie water levels have intruded into tributary river channels and describes the extensive body of work that led to defining these waters. This zone could be its own Assessment Unit.

A lacustuary-based Assessment Unit could then be aligned with the GLWQA targets for the Maumee River basin (as well as other major tributaries draining to Lake Erie). The GLWQA target for spring for the Maumee River equates to 860 tons of total phosphorus and 186 tons of DRP. We recommend using a Flow-Weighted-Mean-Concentrations (FWMC) equivalent as a benchmark to track progress in load reduction during a specific period (e.g., annually or March-July) and address variability by year with respect to flow. A lacustuary-defined Assessment Unit would enable Ohio EPA to make an impairment determination for that AU and apply a nutrient concentration number to a meaningful geography and serve as the basis for a TMDL. The target load and/or FWMC can then be sub-allocated to the watersheds in the Maumee River basin and provide the basis for future TMDLs. This approach would establish a basin-wide framework for TMDLs and provide a mechanism for tracking progress across the basin.

Linking the GLWQA target for the Maumee River basin with the TMDL program is an opportunity synchronize state programs and processes with those at the federal and binational level. A comprehensive approach towards meeting the 40% reduction target and reducing algal blooms is necessary regardless of impairment status of individual water bodies or assessment units.

Response 3: This is an interesting suggestion and something that Ohio EPA will take into consideration in our efforts to implement the Annex 4 recommendations and address far field impacts caused by nutrients. That said, our inland stream and river biocriteria do not apply to lacustuary areas, at this time, and some effort would have to be undertaken to pursue this approach.

Currently, for lacustuary areas, Ohio EPA has to determine aquatic life use (ALU) attainment status with a narrative assessment of the, for the most part, designated warm water habitat (WWH) use. Tools that we have been using over the years to do this include the lacustuary index of biotic integrity (LIBI), modified index of well-being (MIwb) and lacustuary invertebrate community index (LICI) scores and targets that the Agency developed in the mid-1990s to give us an additional way of looking at data from these unique areas. Unfortunately, these have never been codified in rule and are still just one tool that we can look at and use to assess the lacustuaries' ALU status. This will still be the case regardless of whether the lacustuary is its own AU or, as it is now, part of the lower LRAUs for each river; in both situations, the AU is or would be listed as impaired.

Over the years, the lacustuary bio-indices have often been used (and misused) to the point that there is a perception that the benchmarks/thresholds/targets are actual enforceable criteria. On the contrary, the more we have used them, the more we have realized their limitations, especially for the macroinvertebrate LICI scores, which are almost always well below our "targets." Because of this, we need to reevaluate using the macroinvertebrates in the lacustuaries and perhaps focus on some other indicator such as benthic algae to go along with the fish.

In essence, regulation changes are needed to fully support the establishment of lacustuary AUs, so while adoption of this approach can be considered for future reports, it cannot be completed this cycle. Furthermore, it should be noted that the lengths of the lacustuaries decrease rapidly as one heads east and there may be a point where it doesn't make sense to have a lacustuary AU for a major river which only accounts for a few miles of Lake Erie backwater.

Comment 4: [Section L3. Status of Lake Erie Assessment Units]

- [Section L3] does not show the status of implementation plans and the amount of reductions achieved as a result of the plan/TMDL. This needs to be included in the [list].
- These Assessment Units delay field monitoring until 2020 in the Lake Erie watershed. Waiting until 2020 is unacceptable.
- This section should include a basin-wide TMDL for Ohio's western Lake Erie Watershed.

Response 4: While we recognize that the status of implementation plans and the amount of reductions achieved would be useful, the CWA Section 303(d) and 40 CFR 130.7 do not require states to submit these items to U.S. EPA. Only the two-year schedule for TMDL development is required and that is in included in Section J of the report. In addition, Section J and earlier responses to comments explain our position on the best approach for Lake Erie. The schedule indicates that the next monitoring will be done in 2020 because that is the schedule for the next National Coastal Condition Assessment effort that is led by U.S. EPA. Ohio EPA participates in those assessments, which are planned to occur every five years and, where possible, we use the information for assessing the applicable assessment unit. It should be noted however that Ohio EPA does conduct biological and chemical/physical monitoring in the lake every year (see the Lake Erie study plan at: http://epa.ohio.gov/dsw/lakeerie/index.aspx#125073721-nearshore-monitoring)

Aquatic Life Use Comments

Comment 5: According to the most recent report, the Olentangy Watershed has made a miraculous recovery. The 12 Digit HUC (05060001 11 02), the Rush Run-Olentangy River HUC (30.65 sq miles) has a watershed score of 100. This is very misleading and appears as a very unscientific way to approach the actual water quality in the state of Ohio. This watershed has not been sampled by Ohio EPA since 2003-2004 and will not be sampled again until 2018. In light of the fact that there is no new data, **the best course is to keep the actual score from 2003-2004 in place until you can show what the water quality change actually is.**

The only reason that this watershed has a score of 100 is because you have eliminated all the old data (2003-2004) and there are no data points. This should make the score 0 (unknown or not attaining) not 100 (Fully Attaining). FLOW is very supportive of the fact that Ohio EPA needs more funding so that watersheds can be sampled more frequently (every 5-10 yrs). Please put our real data back into the Integrated Assessment Report and show it as historical.

Conversely, the nicer part of our watershed (05060001 11 01 Deep Run Olentangy Watershed 48.91 square miles) only has a score of 33.3 due to 2 points along a small headwater stream (Wildcat Run in Liberty Township Park). This data was collected as part of a Source Water Improvement Grant and does not reflect the watershed health. This part of our watershed has better watershed health.

Response 5: The data from 2003-2004 shows that the Rush Run-Olentangy River assessment unit was in full attainment at the two Olentangy River sites assessed by Ohio EPA. Waters in "full attainment" are assigned an index score of 100. Ohio EPA did not assess any other sites in the tributaries in that HUC in 2003-2004, so it may not have been the best portrayal of the overall HUC status, but we can only use the data we have to calculate the score. Such was the status of this assessment unit beginning with the 2012 Integrated Report when we first assessed this specific HUC-12 with the available 20003-2004 data. We do agree that this can be misleading when the data become more than 10 years old and are deemed historical, as happened in the 2016 IR. When that happens, we flag the assessment unit as being in historical data status but, at the same time, keep the original score for the unit so that readers know what the most recent assessment unit status was. However, by being flagged as historical, the score is no longer used in any statewide statistics generated in the report. Ohio EPA will consider not assigning a watershed index score in future reports for assessment units with newly determined historical data, although we believe there is value in retaining what the most recent score was while ensuring it is not being used in statewide statistic development until new data are collected.

Human Health Use (Fish Contaminants) Comments

Comment 6:

- Fish tissue should be measured for BMAA toxin in brain and neurologic tissue as BMAA has recently been found in the brain tissue in fish from Grand Lake St. Mary's. (Personal communication from Geo. Bullerjahn)
- BMAA unlike microcystin, saxitoxin, et alia, are not being measured. Current literature suggests that this is likely a serious omission.

Response 6: The emerging BMAA toxin is the subject of ongoing medical and environmental research. Studies by the research community have not yet produced thresholds for safe levels of exposure. One major scientific hurdle for evaluating BMAA in fish tissue is that there is a lack of toxicity information available with which to work. What this means in practical terms is that, if we diverted resources to BMAA monitoring in fish tissue, we would still not have any way to interpret the data to conclude if the fish are safe or harmful to consumers. We would be left with numbers without meaning, which is hard to justify.

It cannot be understated that monitoring for emerging toxins is not a simple or straightforward process—it can be incredibly resource-intensive and yet still fail to yield usable information if the science is not properly developed, as the case may be for BMAA at the present.

Please note that Ohio remains at the forefront of algal toxin-monitoring in sport fish. We first partnered with researchers State University of New York to develop a method for analyzing microcystin toxin in fish tissue in 2010. Since then, we have also partnered with researchers at the Ohio State University to continue with this method development to allow us to measure a broader array of microcystin molecules and to measure them more accurately. We are now on the verge of being able to measure all 80+ microcystin molecules in fish tissue, with results expected in early 2017, after seven years of very hard work and a large investment of resources. So far, these results continue to confirm that the risks of microcystin toxicity from consuming Ohio sport fish is low.

Public Drinking Water Supply Use Comments

Summarized Comment 7: Ohio should not use raw water to evaluate the Public Drinking Water Supply Beneficial Use since the use designation applies to waters that, with conventional treatment, will be suitable for human intake and meet federal regulations for drinking water.

Response 7: The commenters are correct in noting that the Public Drinking Water Supply beneficial use is different than other uses in that there is an assumption of some level of source water treatment at a public drinking water treatment plant. Section H clearly states that "Conventional Treatment" is the benchmark for base level of treatment and includes conventional filtration and disinfection. Conventional filtration treatment as defined in Ohio Administrative Code (OAC) rule 3745-81-01, Primary Drinking Water Rules, means a series of processes including coagulation, flocculation, sedimentation and filtration resulting in substantial removal of particles. Treatment process such as powdered active carbon (PAC), granular activated carbon (GAC), ozonation and others are considered advanced treatment beyond conventional measures. Conventional treatment alone is ineffective at cyanotoxin removal and these advanced and expensive processes are often required. Because the presence of cyanotoxins in the raw water necessitates treatment beyond conventional measures it is entirely appropriate to use raw water as an indicator to assess the Public Drinking Water Supply beneficial use. This same approach is also used to evaluate the nitrate indicator because conventional processes are ineffective for nitrate removal.

Summarized Comment 8: There is currently no numeric water quality standard for algae in Ohio and the linkage between the narrative water quality criteria and the Safe Drinking Water Act (SDWA) standards is not demonstrated.

Response 8: During the 2014 reporting cycle, Ohio incorporated assessment of algae into the public

drinking water use assessments. These assessments are based on the aesthetic narrative criteria for algae described in OAC Rule 3745-1-07(A)(4)(c) which calls for protection against adverse aesthetic conditions and specifically applies to all water bodies within 500 yards of a drinking water intake. Because no specific chemical water quality standards exist for algae, Ohio is using the State's drinking water thresholds as an indicator for the narrative criteria. Since conventional treatment is ineffective at removing cyanotoxins, the thresholds provide an appropriate indication when algae is adversely affecting the source water and the beneficial use. Additionally, public water systems that exceed the thresholds in raw water often experience taste and odor events and are required to conduct additional monitoring. If cyanotoxins are detected in finished water it also triggers additional monitoring and treatment requirements with added costs for the public water systems, regardless of whether or not there are MCLs established for cyanotoxins.

Comment 9: Lake Erie's water intake HAB sources need to be a high priority for Ohio EPA. The public water supplies for Lake Erie and its tributaries are experiencing hundreds of millions of dollars in cost to monitor and address toxins in the water intake. The algae toxin sources for all Lake Erie water intakes need to be a high priority for this report to be addressed. Safe Drinking Water Act source water planning and source reductions need to be a high priority for Ohio EPA.

Response 9: Protecting drinking water sources and assuring Ohioans are provided safe drinking water has been and will continue to be a very high priority for Ohio EPA. Ohio's response to harmful algal blooms is viewed by many across the county as one of the leading and most protective programs. Ohio Senate Bill 1 was passed in July 2015 and specifically directed Ohio EPA to implement actions to protect against cyanobacteria in the western basin on Lake Erie and in public water supplies. This legislation led to creation of Ohio Revised Code 3745.50 authorizing the director of Ohio EPA to serve as the coordinator of harmful algae management and response. Ohio EPA was required to implement actions that manage wastewater and limit nutrient loading and develop and implement protocols and actions to protect against cyanobacteria and public water supplies. Ohio adopted new and revised rules, effective June 1, 2016, to meet these requirements, including formalization of health advisory levels, monitoring and reporting requirements for total microcystins in drinking water. Ohio EPA will also continue to be progressive in addressing harmful algal blooms by coordinating Safe Drinking Water Act (SDWA) and Clean Water Act (CWA) programs to address the source of the problem.

Recreation Use Comments

Comment 10: Effective January 4, 2016, Ohio EPA has changed standards on *E. coli* concentrations for recreational water uses. These changes include numerical changes in the bacterial colony count in various use categories, as well as lengthening the time period for "threshold values" from 30 days to 90 days. The time period is extremely significant, since bacterial counts balloon in the warm summer months (June, July and August), which, of course, are the most popular times for water recreation. If you had applied the "new" standards to the data in the 2016 report, instead of the "old" standards, how would the "use attainment" figures reported in Table F-12 be changed? The "old" standards gave 10% supporting and 90% not supporting. This will be important for citizens to assess objectively whether or not water quality is improving.

Response 10: The figures in Table F-12 are derived based on the same criteria and methods that have been used in the past two Integrated Report (IR) cycles. Table F-1 clearly explains the water quality standards (WQS) and methods that were used, which are the WQS that were in place at the time of the analysis. The new *E. coli* criteria were adopted on Jan. 4, 2016, after the calculations were completed

for the 2016 IR. The 2018 IR will be the first cycle where the new *E. coli* criteria are used for the purposes of determining use attainment.

The averaging period used for determining the geometric mean had been the entire recreation season and this was consistent with federal guidance and approved by US EPA. In 2012, US EPA finalized new recreational water quality criteria, which included a change to the averaging period to 30-days compared to their previous guidance on this topic. Ohio EPA adopted revised recreational water quality criteria that became effective on Jan. 4, 2016, which were reviewed by US EPA and found to be consistent with the new federal recommendations as determined in their approval action.

The Jan. 4, 2016, revision of Ohio's recreational water quality criteria actually shortened the averaging period from the entire recreation season (approximately 180 days) in place at the time by about half to 90 days. A 90-day averaging period has a couple of advantages over a shorter 30-day period. First, the 90-day period allows for the collection of more samples which, in turn, allows for the calculation of a more statistically robust geometric mean and therefore a more accurate reflection of water quality and use assessment. The 90-day period also coincides well with the time of peak recreational use, Memorial Day to Labor Day. The majority of data used in recreational use assessment will come from samples collected during this time period.

A very important consideration in trend assessment is making use of a consistent approach and consistent goals against which attainment is being measured. Fluctuations in either of these make simple comparisons in something like percentage supporting versus not supporting difficult because there are moving targets. In recent years, there have been two significant changes to the "goals" (e.g., criteria) in response to mandates by federal requirements and this has also necessitated revisions to the assessment methodology as well. In the 2018 IR, we will be seeking to present some information, perhaps in a comparison of raw values over time, to see if any trends are discernible. Also, please keep in mind that while the averaging period that will be used is 90-days instead of 30-days for the geometric mean component of the criterion, we will also anticipate incorporating the statistical threshold value into the assessment process. This is an element that has not been considered in recent versions of the recreational use assessment. Also, in some cases the geometric mean criteria are also more stringent compared to the criteria used in the 2016 IR.

Summarized Comment 11: Ohio has established water quality standards for algal toxins and should list waters impaired for recreational contact beneficial use now.

Response 11: Ohio has established water quality standards for recreation beneficial use (*E. coli*) and has completed impairment determinations for all current Lake Erie Assessment Units. In fact, both the Lake Erie Western Basin and Central Basin shoreline assessment units are currently listed as impaired for the recreation use. The water quality standard used to assess recreation use in Ohio is *E. coli* based on seasonal geometric mean and single sample maximum values. Section F of the Ohio's 2016 Integrated Water Quality Report contains a detailed explanation of how recreation use is assed in Ohio and specifically at Lake Erie beaches.

Ohio does not currently have "water quality standards" for the recreation beneficial use for cyanotoxins. This seems to be a point of confusion for a number of commenters. The State of Ohio Harmful Algal Bloom Response Strategy for Recreational Waters provides "Cyanotoxin Thresholds for Recreational Waters" that are intended to serve as guidelines for public recreational water managers response to HABs. While the recommended cyanotoxin thresholds for recreational waters are helpful for beach

managers and determining when to post advisories, they are not equivalent to water quality standards. More information about Ohio EPA's water quality standards is available at http://www.epa.ohio.gov/dsw/wqs/index.aspx.

Ohio EPA uses national criteria recommendations in combination with the latest scientific information in setting the appropriate chemical water quality criteria for Ohio's surface waters. U.S. EPA is currently developing HAB exposure criteria and expects to propose recreation use water quality criteria for cyanotoxins by 2017. Ohio EPA will carefully consider any recommended federal standards for adoption in Ohio and expand recreation use assessments as appropriate. While states do have the option to develop state-specific water quality standards, it would require a significant amount of time and resources that would be duplicative to the current federal effort.

Copies of comment letters follow, alphabetical and in the order received.

Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

September 30, 2016

Mr. Peter Swenson, Chief
Watersheds and Wetlands Branch
U.S. EPA Region V
77 West Jackson Blvd.
Chicago, Illinois 60604

Dear Mr. Swenson:

I am writing in response to your August 29, 2016 comments on Ohio's draft 2016 Integrated Report, including our CWA Section 303(d) list of impaired waters. Responses will follow the same order as your comments.

Lake Erie/Nutrients/HABs

In your letter you note that Ohio is responsible for assessing and listing all waters in our jurisdiction, including the State's open waters of Lake Erie, and EPA's role is to review and either approve or disapprove our list of impaired waters. You also state that Ohio needs to assess all of our waters in Lake Erie against all applicable water quality standards, in particular our narrative standard for nutrients and algae. Additionally, you state that Ohio should assemble and evaluate information such as algal coverage, impacts to recreation, impacts to industry, businesses, aquatic life, etc.

Nutrients and algae in Lake Erie are multi-jurisdictional and bi-national issues. It is our firm and consistent position that while we are making significant investments in Ohio waters and watersheds to combat this issue locally, all states and countries surrounding and contributing to problems in Lake Erie should, with leadership from our national EPA, develop a coordinated response.

In my opinion, this is best addressed through a formalized partnership with all the parties involved, and should be handled in a consistent, uniform manner, starting with the assessment and listing process. This reality was recognized in a letter dated November 17, 2015 to the National Wildlife Federation and Clear Water 2 and in press statements announcing the approval of Ohio's 2014, 303(d) list, where US EPA acknowledged that protecting the open waters of Lake Erie is a shared responsibility among the United States, Great Lake states and Ontario.

Part of that shared responsibility starts within CWA section 118(c)(2)(A) that requires USEPA, by 1991, to specify numerical limits on pollutants in ambient Great Lakes waters to protect human health,

aquatic life and wildlife and shall provide guidance to the Great Lakes States on minimum water quality standards, antidegradation policies, and implementation procedures for the Great Lakes System.

Unfortunately, even though well past expectations of congress, USEPA has not proposed a nutrient water quality standard for the waters of Lake Erie. In addition, the International Joint Commission (IJC) has authority to develop recommendations for water quality improvements if requested by USEPA or Environment Canada. I am not aware of any such request of your agency to the IJC, or if so, any resultant recommendations from them.

In the absence of uniform standards that would apply to the open waters of Lake Erie, requiring Ohio to unilaterally develop assessment methods is absurd. This absurdity is compounded when there is no clear process or standard to de-list. Single state assessment and impairment designations are complicated and of questionable value in that the algae is seasonal, transient, spatially and temporally unpredictable, and variable in species make-up, toxicity and bio-accumulation. These issues and others call for an assessment methodology that is devoid of state boundaries and looks at Lake Erie for what it is, one ecological system in which the water flows regardless of state or national borders.

In the 2014 IR, Ohio did provide a planned approach for assessing impairment in the open waters. However, that plan was based on the expectation that the Great Lakes Water Quality Agreement Annex 4 task team would develop concentration thresholds for nutrients, chlorophyll-a or a related parameter which could be used to assess the open lake attainment of our narrative water quality standard - and that did not happen. Instead, the recommendations are to focus on reducing loads from the tributaries, which is where our focus has been and will continue to be.

If the impairment issue was of importance to the jurisdictions and USEPA, then it should have been part of the Annex 4 deliberations – it was not. A lake TMDL was not even discussed as part of the Annex 4 process. The Annex 4 is focused on load reduction, to be addressed through individual state and province Domestic Action Plans. Ohio has, along with Michigan have gone even further than the expectations of Annex 4 by developing our own Collaborative Agreement to meet these international goals and to start far sooner than even Annex 4 is demanding of other states.

To help with consistency, clarity and to provide a path forward that would benefit us all, Ohio suggests the following;

1. USEPA should finalize the recreation standard for algal toxins (microcystin), or at a minimum a threshold that could be used to consistently interpret narrative water quality standards. Once that level is established, it would provide Ohio and other states with at least one common parameter and value to use for assessing and listing the open waters for harmful algal blooms.
2. Ohio in collaboration with USEPA will explore one of the existing processes (GLNPO or IJC) to facilitate a multi-state and Ontario discussion on establishing standards and methods to assess aquatic life use and other standards for use in assessing impairments in Lake Erie.

3. USEPA should recognize and validate that any efforts which will ultimately remove the nutrient impairment from the shoreline and algae toxin impairment from the drinking water in-takes will most likely address water quality issues resulting from excessive nutrients and algae in the open-waters. We are committed to addressing those impairments through Annex 4.
4. USEPA should develop de-listing criteria.

Ohio is not opposed to making impairment designations, evidenced by those already done in Lake Erie, but only when a science based process for designation and de-listing is available. We simply do not believe that the tools and measures are available yet to do so in a manner that is consistent, defendable and appropriate, beyond the shoreline and drinking water in-takes and we will not discuss or propose further listings until there are scientific tools, not political pressure, driving this debate.

Ohio River and ORSANCO

In your letter you stated that Ohio should use ORSANCO data to assess and list the Ohio River. While we acknowledge that the language needs updated since ORSANCO's 2016 report is now available, we respectfully disagree with your request to do our own assessment for the following reasons:

1. We have included the same language related to the Ohio River and ORSANCO in at least our last two Integrated Reports and they were approved by USEPA (see section D of Ohio's 2012 and 2014 Integrated Reports). In fact, the language in those reports was included in the approval documents. It is our understanding that at least one other Region 5 state, Illinois, also defers to ORSANCO in listing the Ohio River as impaired.
2. Ohio's large river assessment procedures were not developed for a river like the Ohio. Of even more importance, biological criteria in the Ohio Water Quality Standards (Table 7-15 in OAC 3745-1-07) recognize this difference and clearly and specifically state that "these criteria do not apply to the Ohio river, lakes or Lake Erie river mouths". Those criteria are what we use to assess our waters for aquatic life use attainment.
3. Ohio EPA and U.S. EPA have both participated onORSANCO's Technical Committee and the Biological and Water Quality Subcommittee and have had staff actively involved with the development of the monitoring and assessment procedures. The current suite of ORSANCO's procedures, including the definition of Ohio River assessment units and the biological criteria thresholds set to ascertain status of the Ohio River aquatic life use, have been fully vetted and approved by the Technical Committee. Water quality criteria adopted by ORSANCO are approved by the Commission, which Ohio EPA also serves on. As Ohio EPA has a similar aquatic life use assessment philosophy as ORSANCO and has a level of comfort with ORSANCO staff capabilities to assess the Ohio River aquatic life use, Ohio EPA, for the last several Integrated Report assessment cycles, has accepted their determination of assessment unit status and condition and incorporated these into Ohio's Integrated Water Quality Monitoring and Assessment reports.

Minor Corrections

Thank you for pointing out these edits. We will make those changes before submitting the final report in a couple of weeks along with our response to comments from the public.

Please contact Cathy Alexander (614-644-2021) of the Division of Surface Water if you need additional information.

Sincerely,

Tiffani Kavalec, Chief
Division of Surface Water
Ohio EPA

cc: Chris Korleski, Director, Water Division, U.S. EPA Region 5

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

AUG 2 9 2016

REPLY TO THE ATTENTION OF:
WW-16J

Tiffani Kavalec, Chief
Division of Surface Water
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216-1049

Dear Ms. Kavalec:

The U.S. Environmental Protection Agency has conducted a review of Ohio's draft 2016 Integrated Report (IR), including Ohio's Clean Water Act Section 303(d) list of impaired waters, which is on public notice through August 29, 2016. We are writing to provide EPA's comments regarding Ohio's Section 303(d) list, as well as comments and commendations for other matters related to the draft IR.

Comments on Lake Erie Listing related to nutrients and Harmful Algal Blooms

Harmful Algal Blooms (HABs) have become increasingly pronounced in Lake Erie in recent years, causing direct impacts on Toledo's drinking water system in 2014. Concerns about nutrient pollution and HABs have led to increased efforts to control nutrients, especially phosphorus, from entering the Lake. Such efforts include the Ohio Lake Erie Phosphorus Task Force, the Western Basin of Lake Erie Collaborative Agreement between Ohio, Michigan and Ontario, and the development of nutrient loading targets under Annex 4 of the Great Lakes Water Quality Agreement between the United States and Canada.

In its 2014 IR, Ohio listed for the first time the shoreline areas of the Western Basin of Lake Erie as impaired due to microcystin in public drinking water supply intake zones. In the draft 2016 IR, Ohio has expanded upon this approach by proposing to add the shoreline areas of the Central Basin and the Western Basin Islands to the impaired waters list for the drinking water supply designated use. EPA commends Ohio EPA for this action.

In its 2014 IR, Ohio EPA proposed a new approach for Lake Erie with new assessment units and methodology for the nearshore and open waters to be used in future listing cycles. Such an approach would provide for a comprehensive assessment of Ohio's Lake Erie waters. However, for reasons discussed in the 2016 draft IR, Ohio EPA does not intend to assess the open waters of either the Western Basin or Central Basin for impairment at this time. The draft IR states "Ohio EPA believes that assessment and listing of the open waters under the CWA should be led by

U.S. EPA in consultation with the states and Ohio is willing to assist its federal partners with the development of appropriate monitoring and assessment protocols for the open waters."

We note that the responsibility to assess Ohio's waters, including the State's open waters of Lake Erie, and determine whether or not they are meeting Ohio's water quality standards, is specifically a state responsibility under the CWA. (See Clean Water Act Section 303(d)(1)(A) and 40 CFR 130.7(d)(1)). EPA's role is to review and either approve or disapprove the state's list of impaired waters. (See 40 CFR 130.7(d)(2)).

Ohio EPA needs to assess all of its waters in the Western and Central Basins of Lake Erie for all applicable water quality standards as defined at 40 CFR 130.7(b)(3). Such standards include numeric criteria, narrative criteria, waterbody uses, and antidegradation requirements. In particular, the state should assess against its narrative standard at 3745-1-04(E):

> *The following general water quality criteria shall apply to all surface waters of the state including mixing zones. To every extent practical and possible as determined by the director, these waters shall be: ... (E) Free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae ...*

In assessing whether the state's applicable water quality standards are being met, Ohio EPA should assemble and evaluate all existing and readily available water quality-related data and other information to evaluate for factors such as:

- The extent of algal coverage
- Chlorophyll a concentrations
- Impacts to recreation, including fishing and beach warnings and closures
- Impacts to industry and commerce, including the commercial fishing and charter boat industry
- Impacts to drinking water, including additional costs to water treatment to treat for algal toxins, and impacts to residents served by water utilities
- Impacts to retail business, including restaurants and hotels
- Impacts to aquatic life

Ohio EPA should also consider the applicability of other numeric and narrative Water Quality Standards to Lake Erie. Ohio EPA should assess the open water of Lake Erie to determine whether or not the lake is meeting all applicable standards, and where it is not, list the appropriate impairments on its final 2016 303(d) list.

Comments on Ohio River and ORSANCO

Page D-5 discusses Ohio EPA's evaluation of the Ohio River. Paragraph three includes the statement "Ohio EPA defers to the ORSANCO analysis and the list of impaired Ohio River segments found in 2014 Biennial Assessment of Ohio River Water Quality Conditions (ORSANCO 2014)." EPA has concerns that Ohio EPA is incorporating the Ohio River Valley Sanitation Commission (ORSANCO) methodology and assessment document for determining impairment of the Ohio River into its 2016 Section 303(d) list:

First, there may be exceedances of Ohio's numeric target for the Ohio River that are not being captured as Category 5 on Ohio's list if the state is relying on the approach being used by ORSANCO's support its 2014 Biennial Assessment of waters. ORSANCO's approach is intended as a 305(b) monitoring and assessment documentation of methodology and results, and is not intended to identify impaired waters in compliance with 303(d) requirements.

Second, for Aquatic Life Use (ALU) impairment status, Ohio EPA requires all sampling locations to meet ALU indices on a large river assessment unit for that river to attain water quality standards using pools (i.e., distance between dams; ranging from 6-95 miles) as the assessment unit. However, ORSANCO aggregates its data collected in a given pool such that a rating of poor in one sampling location within a pool would not necessarily result in that pool determined as not supporting a use. Further, ORSANCO uses the fish community monitoring to determine support of ALU rather than the instream water chemistry. Thus relying on ORSANCOs methodology may lead to a conclusion that the entire river is supporting ALU[1] when a review of chemical data would lead to a different conclusion. For these reasons EPA requests that Ohio EPA conduct its own assessment of the Ohio River using ORSANCO's data and list those river segments that are determined to be impaired.

Comments on Wetlands Data

EPA commends Ohio EPA for applying its three wetland tools to the Scioto TMDL, thereby verifying its Level 1 metrics with Level 2 and 3 tools. Level 1 was used to characterize the wetland condition of the Middle Scioto in 2012, and was used in the TMDL process in 2013. Level 2 is the Ohio Rapid Assessment Method for Wetlands (ORAM) and Level 3 is the Vegetation Index of Biotic Integrity (VIBI), used in 2014 (high scores indicate wetland relatively protected from human disturbance). The results showed consistency in the answers provided by the rapid Level 2 method and the detailed Level 3 assessments for 10 sites in the Middle Scioto, and validated the accuracy of the probabilistic survey of 50 wetlands using only ORAM. EPA recommends that Ohio EPA expand the description on how this information was used in the TMDL. It might be useful to include a description of how the results of the Middle Scioto HUC 12 analysis will be used in TMDL development, implementation, and evaluation (Section I).

We appreciate the inclusion of the wetland status report out. Ohio EPA's proposal to identify a list of special waters as candidates for extra regulatory protection is a positive step and we encourage Ohio EPA to implement this approach.

Commendations on Drinking Water Protection and Inland Waters

EPA commends the Ohio EPA for continuing to review and update its assessment methodology for public drinking water use that first appeared in the 2006 IR. The 2016 methodology refines

[1] From p. 2 of the 2014 Biennial Report from ORSANCO. "(US EPA) guidance indicates "Independent Application" should be used when two or more contradictory data sets exist. The weight of evidence approach is directly opposed to US EPA's policy of independent application, which stipulates that if any one data set indicates impairment, then the water body should be designated as impaired. Although not consistent with EPA, ORSANCO concluded that a direct measurement of aquatic life using biological data is the most effective way of determining whether or not the Ohio River supports its aquatic life use designation."

the use of algal indicators, primarily cyanotoxins that were first added to the 2014 report. EPA encourages the Ohio EPA to expand monitoring or data collection to increase the percent of complete impairment decisions for the next cycle. EPA also encourages the incorporation of some of the possible future algal indicators being considered. (Section H).

EPA supports Ohio EPA's assessment for the drinking water use in inland waters, using nitrate, pesticide, and algae indicators:

- "To emphasize protection of the Public Drinking Water Supply beneficial use from HABs, Ohio is making inland lakes used for public water supply a focus for the next several years for monitoring and improving water quality through TMDLs or other approaches…" (Section C7);

- Moving forward, Ohio continues to intend to … "sharpen focus on Public Water Supply Use," as well as "incorporate HAB considerations into priorities (both PDWS use and ultimately Recreation use), among other priorities" (Section C8);

- "Ohio plans to explore how other types of plans (9 Element Watershed Plans for instance) or regulatory actions could be used more effectively to protect our highest quality waters and/or those that are of high importance for drinking water or recreation" (Section C8);

- "Ohio EPA plans on reviewing the algae impairment assessment methodology prior to the next reporting cycle to determine potential incorporation of U.S. EPA's cyanotoxin health advisories and revisions to the indicators of impairment" (Section H); and

- "Possible future algae indicators include: Total Trihalomethanes (TTHMs) or Haloacetic Acids (HAA5) MCL violations; elevated total organic carbon (TOC); taste and odor events; and additional treatment or source control requirements associated with algae impacts" (Section H).

EPA commends Ohio for establishing a new Harmful Algal Bloom Section to coordinate harmful algae management and response. Page C-29 states "Ohio EPA was required to implement actions that manage wastewater and limit nutrient loading and develop and implement protocols and actions to protect against cyanobacteria and public water supplies. Ohio adopted new and revised rules, effective June 1, 2016, to meet these requirements. Cyanotoxins are not currently regulated in recreational waters….. In 2016, Ohio EPA created a new Harmful Algal Bloom Section housed in the Division of Drinking and Ground Waters to manage both drinking water and recreational response."

Minor corrections

Page C-41: typo "affected" parties

Page E-9: between Dillon and Greenbrier, missing Dudley Run-Rush Creek 05060001 02 03, shown in L1 and L4 as category 5 for Human Health, and between Lizard and Scippo missing Dear Creek Lake – Deer Creek 05060002 02 05 shown in L1 and L4 as category 5.

Thank you for the opportunity to comment on Ohio's draft 2016 IR. If you have any questions on these comments, please contact me at 312-886-0236.

Sincerely,

Peter Swenson

Peter Swenson, Chief
Watersheds and Wetlands Branch

cc: Melinda Harris, OEPA
Cathy Alexander, OEPA

Babb, Rahel

From: Harris, Melinda
Sent: Monday, August 22, 2016 8:08 AM
To: Alexander, Cathy; Babb, Rahel
Subject: FW: 2016 Integrated Assessment Report

Melinda Harris
Rules Coordinator
Division of Surface Water
Ohio Environmental Protection Agency
50 W. Town Street, Suite 700
Columbus, Ohio 43215
(614) 728-1357

From: Laura Fay [mailto:lfay9785@columbus.rr.com]
Sent: Friday, August 19, 2016 4:11 PM
To: EPA dsw.webmail <dsw.webmail@epa.ohio.gov>
Subject: 2016 Integrated Assessment Report

According to the most recent report, the Olentangy Watershed has made a miraculous recovery. The 12 Digit HUC (05060001 11 02), the Rush Run- Olentangy River HUC (30.65 sq miles) has a watershed score of 100. This is very misleading and appears as a very unscientific way to approach the actual water quality in the state of Ohio. This watershed has not been sampled by Ohio EPA since 2003-2004 and will not be sampled again until 2018. In light of the fact that there is no new data, the best course is to keep the actual score from 2003-2004 in place until you can show what the water quality change actually is.

The only reason that this watershed has a score of 100 is because you have eliminated all the old data (2003-2004) and there are no data points. This should make the score 0 (unknown or not-attaining) not 100 (Fully Attaining). FLOW is very supportive of the fact that Ohio EPA needs more funding so that watersheds can be sampled more frequently (every 5-10 yrs). Please put our real data back into the Integrated Assessment Report and show it as historical.

Conversely, the nicer part of our watershed (05060001 11 01 Deep Run Olentangy Watershed 48.91 square miles) only has a score of 33.3 due to 2 points along a small headwater stream (Wildcat Run in Liberty Township Park). This data was collected as part of a Source Water Improvement Grant and does not reflect the watershed health. This part of our watershed has better watershed health.

Sincerely
Laura Fay
Friends of the Lower Olentangy Watershed (FLOW)
Science Committee Chair

Advocates for a CLEAN Lake Erie

CLEAN WATER IS OUR RIGHT!

2975 113TH ST. TOLEDO, OH 43611

August 23, 2016

Tiffani Kavalec, Chief
Ohio EPA Division of Surface Water
Re: Comments on the 2016 Draft Integrated Report

Dear Ms. Kavalec,

Several members of Advocates for a Clean Lake Erie (ACLE) participated in the recent webinar sponsored by the Ohio EPA to explain the 2016 Draft Integrated Report (Report). This letter constitutes our formal comment on it.

ACLE does not support the Report and believes the USEPA should reject it based on the following deficiencies:

1) The Report calls for little or no water quality sampling all the way to the headwaters of impaired streams and rivers.
2) Little or no water quality sampling will be done after wet weather events.
3) There is an over-emphasis on point sources which places unfair burden on municipal sewage treatment plants while giving agriculture a pass.
4) The OEPA claims it has "no authority" to regulate non-point runoff when in fact it does and could exert more if the Ohio legislature granted it. The OEPA should seek legislative changes needed to wield authority adequate to protect the quality of the state's waters.
5) The Report does not call for mandatory, enforceable TMDL's which allow for lawsuits to be filed if there is non-compliance with reduction measures.
6) The Report continues a piecemeal approach declaring only certain rivers or parts of rivers and areas up to 100 meters from shoreline or at water intakes as impaired. There is no coordinated, mandatory and measurable plan to clean up the entire WLEB.

In our opinion, the Ohio EPA needs to take this Draft Report back to the drawing board and return with one that clearly has the health of our drinking water and the health of our citizens at heart.

Sincerely,

Susan Matz
Coordinator

Mike Ferner
Coordinator

Cc: Benita Best-Wong, Director, USEPA Office of Wetlands, Oceans and Watersheds
Tom Wall, Director, USEPA Assessment and Watershed Protection Division
Tinka Hyde Director, USEPA Region 5 Water Division

From: Greg Arko
To: EPA dsw.webmail
Subject: Lake Erie
Date: Thursday, August 25, 2016 9:16:32 PM

It is absolutely pathetic that we sit on the greatest fresh water resources on this planet- yet we continue to defile this treasure! We must do everything necessary to preserve the integrity, safety, and environmental quality of this asset! It is not an endless asset without our stewardship. It must be preserved for our future generations at any cost!
Dr. Gregory Arko
Medina, Ohio

Sent from my iPhone

Vickie A. Askins
6335 Solether Road
Cygnet, Ohio 43413
419.655.2057

August 25, 2016

Ms. Tiffani Kavalec, Chief
dsw.webmail@epa.ohio.gov
Ohio EPA Division of Surface Water
P. O. Box 1049
Columbus, Ohio 43216-1049

Attn: 303(d) Comments

Dear Ms. Kavalec,

Please accept the comments below regarding the draft ***Ohio 2016 Integrated Report*** on behalf of the Ohio Environmental Stewardship Alliance. The OESA is very concerned about the impact massive amounts of nutrient-rich animal manure from concentrated animal feeding operations (CAFOs) is having in the western Lake Erie basin. This concern stems from Ohio's ineffective split CAFO permitting programs and Ohio's failure to enact new legislation that closes the huge loopholes in the Ohio Department of Agriculture's Livestock Environmental Permitting Program.

1. Ohio EPA states under **Section C1. Program Summary – Surface Water – Concentrated Animal Feeding Operations**:

> On December 14, 2000, Governor Taft signed a bill that started the process of transferring authority to regulate concentrated animal feeding operations (CAFOs) to the Ohio Department of Agriculture (ODA), which now regulates construction and operation of large concentrated animal feeding facilities under their Permit to Install (PTI) and Permit to Operate (PTO) programs.

This section of the Integrated Report is very brief but I believe it has huge implications. Governor Taft started this transfer process in 2000 after Ohio legislators passed Senate Bill 141. This Bill transferred authority over part of Ohio EPA's CAFO NPDES permitting program to the ODA - with the stipulation that the ODA submit a program that complied with the Clean Water Act to the EPA within 180 days***.*** However, Governor Taft did not submit the ODA's program to US EPA until December 2006. *Sixteen years after the passage of SB 141 – the U.S. EPA has still not approved the ODA's program - yet the ODA has been issuing CAFO permits since 2002.*

Confined or concentrated animal feeding operations house tens of thousands of animals or hundreds of thousands of poultry in industrial environments, which can result in a myriad of environmental problems since it concentrates massive amounts of manure in small areas. The last twenty years has seen a huge influx of CAFOs into the western Lake Erie basin.

A diverse group of scientific professionals and state agency specialists developed the ODA's "state" Livestock Environmental Permitting Program in 2001. However, the ODA has repeatedly revised these rules over the years and severely weakened the Program. The LEPP now contains many convoluted loopholes, the largest of which allows CAFO owners to circumvent all the other rules by simply selling their manure to someone else.

OEPA acknowledged via a June 2005 letter to all pending CAFO NPDES Permit applicants that ODA MMPs did **not** comply with federal NPDES laws and for that reason could **not** be used for NPDES Permits. According to Kevin Elder of the ODA – The ODA MMP "is **not** administered according to the Clean Water Act and is **not** a part of Ohio EPA's NPDES permit program for CAFOs." <u>However, the OEPA started incorporating these inadequate "State" plans in federal NPDES permits about 10 years ago</u>.

The Waterkeeper Alliance Decision included a requirement that each CAFO must develop and implement a nutrient management plan. "But not just any nutrient management plan suffices under the Rule. On the contrary" CAFOs must incorporate a NMP that "incorporates the requirements…based on a <u>field-specific assessment</u> of the potential for nitrogen and phosphorus transport from the field and that addresses the form, source, amount, timing and method of application of nutrient <u>on each field</u>…" Many ODA MMPs include only one sentence that states "The CAFO owner will sell all the manure to others not under the control of the CAFO owner." Consequently, ODA MMPs make a mockery of federal laws and should not be incorporated into NPDES Permits.

Former OEPA Director Chris Korleski and former ODA Director Robert Boggs submitted a joint letter to the heads of the Senate and House Agriculture Committees in 2009. They suggested immediate action was crucial because 2008 CAFO regulations had not yet been incorporated into the ODA's program. If ODA did not adopt specified statutory changes as quickly as possible, they suggested one alternative would have been to transfer the provisions back so the Ohio EPA could adopt the necessary rules to conform to the new federal CAFO requirements.

Later in 2009, Director Korleski endorsed transferring the NPDES permitting authority to the ODA. However, in comments before the House Agriculture and Natural Resources Committee, he stressed "In my view, if the CAFO regulations are not incorporated into ODA's program, and if Ohio does not complete all the necessary steps to allow, once and for all, <u>the full and final transfer</u> of the NPDES program for CAFOs to ODA, then the regulatory confusion over the program will continue."

To demonstrate how confusing Ohio's split permitting scheme is – US EPA Robert Tolpa commented on the ODA's proposed program and said that [federal] NPDES provisions should have been incorporated into the ODA's [state] Permit to Operate. He also commented – "Understanding of this dual permitting approach is critical to understanding how ODA intends to regulate CAFOs."

It is also important to note that the *Ohio EPA Nutrient Reduction Strategy Report* to US EPA stated– "Dramatically improve manure management practices – the improper management of livestock manure and continued over application of manure on soils that are already saturated with nutrients is a significant challenge… *Effective manure management is critical if we are to see water quality improvements and/or measurable reductions in nutrient loadings to our streams."*

The Ohio EPA Integrated Report goes on to state "The CAFO program at Ohio EPA uses a watershed perspective to prioritize work to some degree." Ohio has seen a huge influx of CAFOs over the past 20 years. There are almost 150 industrial-size CAFOs in the western basin, housing over 12 million animals that produce 700 million gallons of waste annually. It is well known that CAFOs are a big part of the pollution problem in the Chesapeake Bay, Green Bay, and Grand Lake St. Mary's watersheds, as well as many other areas in this Country.

That being the case, why isn't Ohio EPA monitoring ALL Ohio CAFOs since US EPA has not approved any transfer of regulatory authority to the ODA?

2. Numeric Water Quality Standards for CAFOs - Oho EPA noted in the 2014 Integrated Report that the "State's narrative criteria at OAC 3745-01-04(E), prohibiting, among other things, nuisance growths of algae created by nutrients entering the water as a result of human activity. Given the prevalence of HABs in the WLEB, in EPA's April 15, 2014 letter to OEPA, EPA encouraged Ohio to develop a methodology for assessing for attainment of the nuisance algal growth narrative water quality criteria."

Ohio has been trying to develop **numeric** water quality criteria for many years but has failed to complete this critical task. Ohio EPA needs to set numbers for the maximum concentration of pollutants in a stream—regardless of their source—rather than generalized **narrative** standards.

40 C.F.R. 123.36 Establishment of technical standards for concentrated animal feeding operations" states – If the State has not already established technical standards for nutrient management that are consistent with 40 CFR §412.4(c)(2), the Director **shall** establish such standards by the date specified in §123.62(e).

Why hasn't Ohio EPA established numeric water quality standards for CAFOs?

Conclusion: OESA appreciates the opportunity to comment on this Integrated Report. We strongly urge Ohio EPA to rectify Ohio's unlawful split CAFO permitting scheme and also to adopt numeric water quality standards for CAFOs.

Respectfully,

Vickie A. Askins

cc: Mike Ferner, ACLE
Adam Riesen, OEC
Sandy Bihn, Lake Erie Waterkeeper

From: Ray Gajkowski
To: EPA dsw.webmail; conservationi3
Subject: Lake Erie
Date: Thursday, August 25, 2016 7:42:54 PM

I'm writing to insist that the Ohio EPA take all necessary measures to clean up Lake Erie.

You must cut through the thin political fog and do what is right. We certainly can afford it!

Declare the whole western basin impaired

Include wet weather when assessing nutrient runoff

Include algae/toxin's in the recreational contact impairments

Provide reports to the public on details of the progress of your efforts

Request that the Ohio Department of Agriculture put more limits on the application of manure

Thanks
Raymond Gajkowski
11888 Whitestone Ct.
North Royalton, OH 44133

From: Harris, Melinda
To: Alexander, Cathy; Babb, Rahel
Subject: FW: 303(d) Comments
Date: Thursday, August 25, 2016 3:49:31 PM
Attachments: image001.png

Melinda Harris
TMDL Supervisor / Rules Coordinator
Division of Surface Water
Ohio Environmental Protection Agency
50 W. Town Street, Suite 700
Columbus, Ohio 43215
(614) 728-1357

Ohio Environmental Protection Agency

From: Kim Kaufman [mailto:kimkaufman@bsbo.org]
Sent: Thursday, August 25, 2016 3:48 PM
To: EPA dsw.webmail <dsw.webmail@epa.ohio.gov>
Subject: Re: 303(d) Comments

August 25, 2016
Re: 303(d) Comments

Ohio EPA
Division of Surface Water, P.O. Box
1049, Columbus, Ohio 43216-1049

To Whom It May Concern:

Thank you for this opportunity to submit comments on Ohio's Clean Water Act and Lake Erie water quality. As a resident of Carroll Township, Ottawa County, Ohio, my concerns for the health of Lake Erie and related drinking water resources are particularly relevant. On September 5, 2013, microcystin, the potentially lethal toxin in Lake Erie's blue-green algae, exceeded levels beyond the capability of our Carroll Township water treatment plant. Two thousand people could not drink the water.

I was one of them.

I reference the following Toledo Blade article by Tom Henry about this crisis in which I am quoted.
http://www.toledoblade.com/local/2013/09/15/Carroll-Township-s-scare-with-toxin-a-wake-up-call.html

Lake Erie is the drinking water source for 11 million people and is vital to Ohio's economy. I respectfully request that:

1. the Western Basin of Lake Erie be declared "Impaired," and that the Toledo and Oregon intakes be part of the basin-wide impairment, rather that the proposed nearshore area which is not a major contributor to the intake algae;

2. Ohio EPA include wet weather in assessing nutrient runoff;

3. Ohio EPA include algae/toxins in its recreational contact impairments;

4. Ohio EPA provide an annual report to the public that identifies sources and amounts of Lake Erie algae/nutrients, and how many pounds/units are reduced from the funding/changes to reduce nutrient runoff;

5. Ohio EPA request the Ohio Department of Agriculture to create rules that limit manure application of phosphorus to the crop need/agronomic amount.

Thank you for considering my concerns and my request for action.

Sincerely,

Kimberly Kaufman
Resident, Carroll Township, Ottawa County, Ohio
Executive Director
Black Swamp Bird Observatory
Oak Harbor, Ohio 43449
419-898-4070 (Ext. 201)

From: EYandek@aol.com
To: EPA dsw.webmail
Subject: Comments on Ohio EPA 303(d) Lake Erie Water Quality
Date: Thursday, August 25, 2016 10:51:33 PM

TO:

Ohio EPA
Division of Surface Water, P.O. Box
1049, Columbus, Ohio 43216-1049
dsw.webmail@epa.ohio.gov

Subject : 303(d) Comments on Lake Erie Water Quality

Thank you for this opportunity to submit comments on Ohio's Clean Water Act -- Lake Erie Water Quality.

Lake Erie is the drinking water source for 11 million people and is commercially vital to Ohio's economy. It is a matter of public record that Ohio residents want prompt and decisive action to be taken to improve Lake Erie water quality.

As such, it is imperative that the following actions be taken --

1. The Western Basin of Lake Erie should be declared impaired.

2. The Toledo and Oregon intakes should be part of a basin wide impairment. The proposed near shore area has been proven by studies to not be the major contributor to the Lake Erie algae issue.

3. Ohio EPA should include wet weather (rain) factors in assessing nutrient runoff as already justified by scientific studies and current HAB predictive models.

4. Ohio EPA should include harmful algae toxin concentrations when assessing recreational contact risks.

5. Ohio EPA should provide an annual report to the public that identifies sources, amounts of Lake Erie algae/nutrients, and how many pounds/units have been reduced from efforts aimed at reducing nutrient runoff.

6. Ohio EPA should request that the Ohio Department of Agriculture create specific rules that limit manure application of phosphorus to crops and that the permissible levels be limited to an absolute minimum amount since such applications have been determined to be a major source of harmful algal blooms. Pig farms are one such proven source of unacceptable manure application.

Sincerely,

Edward M Yandek
3025 East Overlook Rd
Cleveland Hts, OH, 44118

EYandek@aol.com

216-321-0467

From:	Harris, Melinda
To:	Alexander, Cathy; Babb, Rahel
Subject:	FW: comments on Ohio's Clean Water Act Lake Erie water quality
Date:	Friday, August 26, 2016 10:31:06 AM
Attachments:	image001.png

Melinda Harris
TMDL Supervisor / Rules Coordinator
Division of Surface Water
Ohio Environmental Protection Agency
50 W. Town Street, Suite 700
Columbus, Ohio 43215
(614) 728-1357

From: Little Sister [mailto:bandore4u@gmail.com]
Sent: Friday, August 26, 2016 9:44 AM
To: EPA dsw.webmail <dsw.webmail@epa.ohio.gov>
Subject: comments on Ohio's Clean Water Act Lake Erie water quality

Ohio EPA
Division of Surface Water, P.O. Box
1049, Columbus, Ohio 43216-1049
dsw.webmail@epa.ohio.gov

Attn: 303(d) Comments

Thank you for this opportunity to submit comments on Ohio's Clean Water Act Lake Erie water quality. Lake Erie is the drinking water source for 11 million people and is vital to Ohio's economy. The following is requested:

1. That the western basin of Lake Erie be declared impaired and that the Toledo and Oregon intakes be part of the basin wide impairment rather that the proposed near shore area which is not a major contributor to the intake algae.

2. That Ohio EPA include wet weather in assessing nutrient runoff.

3. That Ohio EPA include algae/toxin's in its recreational contact impairments.

4. That Ohio EPA provides an annual report to the public that identifies sources and amounts of Lake Erie algae/nutrients and how many pounds/units are reduced from the

funding/changes to reduce nutrient runoff.
5. That Ohio EPA request the Ohio Department of Agriculture to create rules that limit manure application of phosphorus to the crop need/agronomic amount.

Thank you!

Resident of Maumee Watershed, receiving water from Lake Erie,\

Sue Terrill
1722 Eileen Rd.
Toledo, OH 43615

From:	Claire Tinkerhess
To:	EPA dsw.webmail
Subject:	Ohio"s Clean Water Act Lake Erie
Date:	Friday, August 26, 2016 7:40:57 AM

To Whom It May Concern,

I am writing about Ohio's Clean Water Act Lake Erie water quality. I hope you will take this opportunity to make a difference in the future of Lake Erie by adopting the following proposals:

1. That the western basin of Lake Erie be declared impaired and that the Toledo and Oregon intakes be part of the basin wide impairment rather that the proposed near shore area which is not a major contributor to the intake algae.
2. That Ohio EPA include wet weather in assessing nutrient runoff.
3. That Ohio EPA include algae/toxin's in its recreational contact impairments.
4. That Ohio EPA provides an annual report to the public that identifies sources and amounts of Lake Erie algae/nutrients and how many pounds/units are reduced from the funding/changes to reduce nutrient runoff.
5. That Ohio EPA request the Ohio Department of Agriculture to create rules that limit manure application of phosphorus to the crop need/agronomic amount.

Claire Tinkerhess
183 Vine Street
Lakeside Ohio 43440

621 Miner
Ann Arbor MI 48103

ctinkerhess@comcast.net

From:	Harris, Melinda
To:	Alexander, Cathy; Babb, Rahel
Subject:	FW: 303(D) Comments
Date:	Monday, August 29, 2016 8:05:26 AM
Attachments:	image001.png

Melinda Harris
TMDL Supervisor / Rules Coordinator
Division of Surface Water
Ohio Environmental Protection Agency
50 W. Town Street, Suite 700
Columbus, Ohio 43215
(614) 728-1357

From: Rob Wolas [mailto:sbc2000rw@comcast.net]
Sent: Sunday, August 28, 2016 12:25 PM
To: EPA dsw.webmail <dsw.webmail@epa.ohio.gov>
Subject: 303(D) Comments

Thank you for this opportunity to submit comments on Ohio's Clean Water Act Lake Erie water quality.

The following comments are submitted of behalf of the Associated Yacht Clubs.

We are a 30,000 member organization based in the western end of Lake Erie

Our mission is to promote safe boating and waterways ecology for our members and we meet monthly.

We are also members of the Lake Erie Waterkeeper organization.

The following items are requested:

That Ohio EPA include algae/toxin's in its recreational contact impairments

That Ohio EPA include wet weather in assessing nutrient runoff

That Ohio EPA request the Ohio Department of Agriculture to create rules that limit manure application of phosphorus

to the crop need/agronomic amount

That the western basin of Lake Erie be declared impaired and that the Toledo and Oregon intakes be part of the basin
wide impairment rather than the proposed near shore area which is not a major contributor to the intake algae

That Ohio EPA provides an annual report to the public that identifies sources and amounts of Lake Erie algae/nutrients
and how many pounds/units are reduced from the funding/changes to reduce nutrient runoff

The Associated Yacht Clubs is very aware that Lake Erie is the drinking water source for millions of people
and is vital to Ohio's economy

Sincerely,

Robert Wolas
Executive Secretary
Associated Yacht Clubs
30432 Windsor
Gibraltar, Michigan 48173
sbc2000rw@comcast.net

ALLIANCE FOR THE GREAT LAKES
ENSURING A LIVING RESOURCE FOR ALL GENERATIONS

August 29, 2016

VIA EMAIL TO: dsw.webmail@epa.ohio.gov

Ohio EPA
Division of Surface Water
P.O. Box 1049
Columbus, Ohio 43216-1049
Attn: 303(d) Comments

RE: Comments on Ohio's Draft 2016 Clean Water Act Section 303(d) list and Integrated Water Quality Monitoring and Assessment Report

Dear Ohio EPA:

The Great Lakes are a global treasure – their waters sustain millions of people, thousands of communities, a vibrant economy and a truly remarkable ecosystem. Harmful and nuisance algal blooms caused by excess nutrient runoff are among the top threats to the Great Lakes, posing risks to drinking water supplies, quality of life and economic vitality. Nowhere is this more obvious than in the western Lake Erie basin. Our comments below supplement comments we joined with the Ohio Environmental Council and other groups, which we also support.

We are concerned that Ohio has violated its Clean Water Act Section 303(d) regulatory obligation to identify impaired or threatened waters with regard to Lake Erie. Ohio's draft 303(d) report fails to assess the open waters of western Lake Erie pursuant to the narrative criteria of OAC 3745-1-04(E), which requires all surface waters of the state, including the open waters of Lake Erie that fall within Ohio's jurisdiction, to be "free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of algae." The 303(d) list is a vital part of meeting Ohio's water quality standards and working toward the Clean Water Act's goal of drinkable, fishable and swimmable waters. Algal blooms resulting from excessive nutrients are unsightly, odorous, and detrimental to recreation. Algae may also interfere with drinking water treatment and some types of algae can produce toxins harmful to humans and wildlife.

Ohio's failure is especially concerning since U.S. EPA requested that Ohio EPA develop a methodology to assess the narrative criteria in a letter to the agency in April 2014 and in its decision document for the partial approval of the 2014 Integrated Report (available at http://www.epa.ohio.gov/Portals/35/tmdl/U.S%20EPAs%202014%20supporting%20decision%20document.pdf).

150 N. Michigan Ave. • Suite 700 • Chicago, Illinois 60601 • (312) 939-0838 • alliance@greatlakes.org • www.greatlakes.org

Buffalo • Chicago • Cleveland • Detroit • Grand Haven • Milwaukee

Data available from NASA and the U.S. EPA's Great Lakes National Program office amply demonstrate the prevalence of algal blooms in the open waters of western Lake Erie. Identifying an impairment of uses caused by algal blooms is a macro-level observation. Given the data that is readily available through federal agencies, park employees, academic institutions, and citizens, it is reasonable to expect Ohio EPA to have at this point either identified or gathered the requisite Level 3 data in order to assess the narrative criteria for the open waters of western Lake Erie. U.S. EPA has repeatedly instructed Ohio EPA on the need to assess the open waters of western Lake Erie within Ohio's jurisdiction pursuant to Ohio EPA's own narrative criteria at OAC 3745-1-04(E) and this report should have included such an analysis. We, therefore, respectfully request that Ohio EPA include the open waters of western Lake Erie in its 303(d) list before it is submitted to U.S. EPA.

Ohio EPA's failure to assess the open waters of western Lake Erie and make an impairment determination for these areas is improper since Ohio is required to evaluate and list all waters failing to meet any applicable water quality standard. Ohio should assemble and evaluate all existing and readily available water quality-related data and information against its narrative standards. In particular, Ohio should address data on Lake Erie's phosphorus and algae conditions summarized in the May 2015 report "Recommended Phosphorus Loading Targets for Lake Erie" developed under the Great Lakes Water Quality Agreement and available online at: http://binational.net/wp-content/uploads/2015/06/nutrients-TT-report-en-sm.pdf. Based on these data, Ohio should list western Lake Erie as impaired by nutrients and algae.

Thank you for considering our comments. Should you have any questions about these comments, please do not hesitate to contact me.

Sincerely,

Molly M. Flanagan

Molly M. Flanagan
Vice President, Policy

Ohio EPA
Division of Surface Water, P.O. Box
1049, Columbus, Ohio 43216-1049
dsw.webmail@epa.ohio.gov

August 29, 2016

Attn: 303(d) Comments

On behalf of the undersigned groups please accept these comments in response to the July 29, 2016 Notice of Availability and Request for Comments Federal Water Pollution Control Act Section 303(d) TMDL Priority List for 2016. Our comments center not only on the priority list but also on the analysis and information in the Ohio 2016 Integrated Water Quality Monitoring and Assessment Report Final Draft (Integrated Report).

While our organizations care about all of Ohio's waterways, our specific focus in these comments is on pollution that causes the growth of harmful algal blooms and related cyanotoxin production in Lake Erie. As described in our comments below, we urge an immediate determination that the open waters of Lake Erie are impaired. This requires analyzing data according to a specific methodology in order to find the open waters are failing to provide defined designated uses. Since Ohio EPA did not complete the requisite analysis, then the U.S. EPA must do so. Ohio EPA should also work with U.S. EPA to develop a comprehensive regional TMDL that limits total and soluble phosphorus feeding algae pollution. In addition, we ask Ohio EPA to explain in its Integrated Report how the agency will address the 2015 Ohio Supreme Court's decision in Fairfield County v. Nally, which has had significant legal, programmatic, and water quality implications. Until such time Ohio restores the validity of its TMDLs and can ensure timely development of future TMDLs, it may be necessary for the U.S. EPA to administer Ohio's program.

A Determination of Lake Erie's Impairment Status is Required by the Clean Water Act

The Integrated Report explains Lake Erie was separated into three shoreline assessment units extending 100 meters out from the shore in the western and central basins as well as the islands. It further states, "[t]hese assessment units also include Public Drinking Water Supply intake zones (500-yard radius around intakes) associated with the nearest shoreline unit even if they are greater than 100 meters from the shore,"(p. D-2). Areas outside these assessment units are considered the "open waters."

The Integrated Report also explains the open waters were not analyzed for potential impairment citing efforts to reduce phosphorus loads entering the western basin through the Great Lake Water Quality Agreement, and because the open waters have shared federal oversight between both the U.S. and Canadian governments:

> For this and other reasons outlined in Section J3, Ohio does not intend to pursue development of the open water assessment units and methods at this time. (Integrated Report, p. D-6)

Our organizations recognize the complexity of shared jurisdiction, and also support efforts under the Great Lake Water Quality Agreement to protect, restore and enhance the waters of all the Great Lakes. However, the Clean Water Act (section 303(d)(1)(A)) has clear requirements for the open waters:

> Each State shall identify those waters within its boundaries for which the effluent limitations required by section 1311(b)(1)(A) and section 1311(b)(1)(B) of this title are not stringent enough to implement any water quality standard applicable to such waters. The State shall establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters.

In order to identify those waters where effluent limits are not sufficient to implement water quality standards, the Ohio EPA had a clear duty to analyze credible data according to a specific methodology to determine potential impairment of designated uses and water quality criteria defined in the Ohio Administrative Code (O.A.C.). In fact, the 2014 Integrated Report states,

> Lake Erie is defined in Chapter 3745-1 of the Ohio Administrative Code (Ohio's Water Quality Standards) as Exceptional Warmwater Habitat (EWH). As such, numeric criteria for the protection of aquatic life set forth in rules 3745-1-07 (statewide criteria), 3745-1-31 (Lake Erie standards) and 3745-1-33 (Lake Erie drainage basin criteria) apply and must be met as outside mixing zone standards.
> (2014 Integrated Report, p. I-30).

Additionally, other standards and criteria apply as well, including those in the O.A.C. 3745-1-04 titled "Criteria applicable to all waters" that lists specific water quality criteria; specifically one directing surface waters to be,"(E) Free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae."

It is clear the O.A.C. contains both water quality standards and criteria for the open waters of Lake Erie, therefore it is incorrect for the Integrated Report to claim "[c]urrently no established standards for Lake Erie open waters," in Figure J- 6 titled *Key steps in the state TMDL and binational Annex 4 processes*, (Integrated Report, p. J-13).

Furthermore, the U.S. EPA accepted the state's 2014 303(d) list with the exception of the open waters for western Lake Erie in a August 2015 letter to the Ohio EPA (enclosed). Here the U.S. EPA deferred its decision to accept or reject Ohio's omission of waters beyond the shoreline assessment unit on the 2014 303(d) list for public drinking water supply, explaining:

> EPA's deferral is due to proposed additions to Ohio's Lake Erie AUs [assessment units] that would expand coverage to all drinking water intakes in the WLEB [western Lake Erie basin] for the next listing cycle. EPA is only deferring action on assessment determinations related to microcystin impacts to the PDWS [public drinking water sources] use for the open waters of the WLEB.

The referenced assessment units were proposed in the 2014 Integrated Report under section I5.2.2 (p. I-32,33), and divided the western basin into three separate assessment units: Shoreline, Nearshore and Offshore. Overall, ten Lake Erie assessment units were proposed. The western basin Nearshore assessment unit would include the public drinking water supply intake for the cities of Toledo and Oregon. However, in the 2016 Integrated Report, Ohio EPA chose not to utilize this approach and included as part of the western basin shoreline unit an additional 500 yard radius zone around the drinking

water intakes beyond 100 meters from the shoreline. It is unclear if the U.S. EPA would have deferred approval of the 2014 303(d) list had Ohio EPA proposed this approach in its 2014 Integrated Report. What is clear though, is that U.S. EPA expected Ohio to evaluate all ten Lake Erie assessment units:

> EPA will coordinate with Ohio EPA and expects Ohio EPA to fully assess the ten AUs for Lake Erie and to assemble and evaluate all existing and readily available data, including EPA data, for the 2016 integrated report and listing cycle...EPA notes that Ohio has not assessed Lake Erie with respect to the State's narrative criteria at OAC 3745-01-04(E), prohibiting, among other things, nuisance growths of algae created by nutrients entering the water as a result of human activity. Given the prevalence of HABs in the WLEB, in EPA's April 15, 2014 letter to OEPA, EPA encouraged Ohio to develop a methodology for assessing for attainment of the nuisance algal growth narrative water quality criteria. Ohio responded in a letter on May 28, 2014 that it would consider those methods that meet its requirement for credible data, and that biomass may be used once a reliable method is established and accepted. Finally, in its future assessment of the new Lake Erie AUs, EPA requests that Ohio consider the impacts of HABs and nuisance algal growth on aquatic life use, in addition to the impacts on recreational use.
> (p.15-16)

Ohio's 2014 Integrated report, in section I5.2, details an entire framework for evaluating Lake Erie water quality, including data sources. The 2016 Integrated Report does not explain why this framework is not sufficient to assess the open waters, and rather than develop a methodology to assess the degree to which Lake Erie is meeting its water quality criteria, the Ohio EPA explained the US EPA was the proper agency to conduct this assessment:

> Ohio EPA believes that assessment and listing of the open waters under the CWA should be led by U.S. EPA in consultation with the states and Ohio is willing to assist its federal partners with the development of appropriate monitoring and assessment protocols for the open waters.
> (Integrated Report, p. D-6)

Existing data supports an impairment designation of the open waters of Lake Erie. In October 2011, the National Aeronautics and Space Administration Landsat-5 satellite acquired images of the microcystin bloom covering much of the western basin of Lake Erie (National Aeronautic and Space Administration, Toxic Algal Bloom in Lake Erie).[1] NASA again captured Lake Erie's harmful algal bloom with satellite imagery in August 2014 (NASA Earth Observatory, Algae Bloom on Lake Erie).[2] According to U.S. EPA, data available from the U.S. EPA's Great Lakes National Program office also demonstrates the prevalence of nuisance HAB's in the open waters of Lake Erie. Images taken and testimony by recreationalists and state park employees also speak to the nuisance quality of the algal blooms in the open waters of Lake Erie.

Given the data that is readily available through federal agencies, park employees, and citizens, it is reasonable to expect Ohio EPA to have at this point either identified or gathered the requisite Level 3 data in order to assess the narrative criteria for the open waters of Lake Erie. U.S. EPA has repeatedly instructed the Ohio EPA on the need to assess the open waters of Lake Erie within Ohio's jurisdiction

[1] See http://visibleearth.nasa.gov/view.php?id=76127)
[2] See http://earthobservatory.nasa.gov/IOTD/view.php?id=84125)

pursuant to Ohio EPA's own narrative criteria at OAC 3745-1-04(E) and it was expected that this report would include such an analysis.

The Clean Water Act establishes a statutory duty to determine the extent Lake Erie's open waters provide designated uses and meet narrative water quality criteria. Since Ohio EPA has failed to conduct this analysis, we agree with Ohio EPA that U.S. EPA should complete this task, and it is imperative the Region 5 office begin the process immediately, especially since an open water impairment determination has been pending for so long. Therefore, U.S. EPA should include a timeframe for completing the determination in its response to Ohio's 2016 303(d) list. Should U.S. EPA decline Ohio's invitation to analyze the open waters, then it should also reject Ohio's 303(d) list. Failure by U.S. EPA or Ohio EPA to analyze credible data according to a specific methodology in order to make an impairment determination for the open waters would constitute a Clean Water Act violation.

Lake Erie TMDL Development Requires a Comprehensive Approach

Our organizations agree the western Lake Erie basin shorelines, and areas around the islands as well as Toledo's drinking water intake do not provide beneficial uses or meet Ohio's water quality criteria due to harmful algal blooms and other factors identified in the Integrated Report.

It is widely understood phosphorus pollution from the Maumee River is the main driver of western Lake Erie's toxic algae. Numerous scientists estimate 85% of the river's pollution comes from crop fields and livestock operations, and multiple factors affect the degree of toxicity from harmful algal blooms such as the amount of nitrogen available to the cyanobacteria, the concentration of algal mass and the mixing of algae in the water column. Toledo's water crisis was due in part to wind and waves pushing the mass of algae over Toledo's drinking water intake and waves mixing the cyanotoxins into the water column. This means harmful algal blooms that occur outside the shoreline assessment units directly affect the ability to restore beneficial uses within them.

Therefore restoring water quality within the impaired assessment units requires a comprehensive approach that addresses harmful algal blooms throughout the entire western basin and its watershed. Such a solution is available through the establishment of a Total Daily Maximum Load (TMDL) for both total and soluble phosphorus that applies to all sources throughout the entire western Lake Erie watershed and the open waters. Obviously the open waters do not have an impairment designation, nor do all the assessment units throughout all the western basin watershed. Here the Chesapeake Bay TMDL is instructive since it applies to all assessment units throughout the entire watershed regardless of impairment status. For those assessment units with an existing TMDL, if the Bay TMDL is lower it takes precedence. This provides an instructive model since in order to bring the western basin shoreline assessment unit and the public drinking water supply zones back into attainment, all sources of phosphorus must meet a total and soluble phosphorus TMDL. Given this would include areas in Michigan and Indiana as well as Ohio, the U.S. EPA should develop a regional TMDL for total and soluble phosphorus for the three states. The US EPA can then work with Canada and Ontario to help meet the TMDL for the open waters given the provincial and Canadian federal government have different, but complementary, regulatory mechanisms that can ensure phosphorus levels do not exceed the TMDL.

However, the Integrated Report does not give priority status to develop any TMDL for the Lake Erie impaired assessment units, nor does it call on the U.S. EPA to help develop one for the three states. Rather the Integrated Report lists several efforts currently underway or in development:

> Ohio is working to address its contribution to the problems in Lake Erie through nutrient TMDLs on tributaries; numerous state initiatives to reduce nutrient loads from Ohio; and active participation on Annex 4 (Nutrients) and other Great Lakes Water Quality Agreement (GLWQA) efforts.
> (Integrated Report p. J-11,12)

Each of these initiatives and agreements offer opportunities to restore Lake Erie's water quality if they include effective mechanisms that adequately identify and addresses all sources of total and soluble phosphorus. However, Ohio EPA's characterization and reliance on existing nutrient western basin watershed TMDLs is problematic, especially since they do not include soluble phosphorus loads. This is significant since both the Ohio Collaborative Agreement and the Annex 4 Phosphorus Loading Objectives and Targets include reductions in soluble phosphorus. Additionally, relying on existing total phosphorus TMDLs to help restore shoreline beneficial uses relies on two unproven and arbitrary assumptions: 1) restoring beneficial uses for aquatic habitat, recreation and other uses in the impaired watershed and large river assessment units will also restore beneficial uses for the western Lake Erie shoreline assessment unit including the PDWS intake zones; and 2) total and soluble phosphorus in assessment units currently not impaired or without approved TMDLs do not significantly contribute to western basin shoreline impairment. If Ohio EPA continues to rely on its current TMDL program to meet Annex 4 targets or achieve a 40 percent phosphorus reduction goal by 2025, it must demonstrate a clear link between meeting currently established TMDLs and restoring water quality in Lake Erie. This will be difficult at best given the Ohio EPA statement in the Integrated Report:

> Because Ohio lacks a WQS criterion for total phosphorus concentration in Lake Erie, TMDLs were not developed to address the excessive wet weather loads delivered to Lake Erie.
> (Integrated Report, p. J-12)

Therefore it is unclear if the tributary TMDLs can significantly restore shoreline beneficial uses and meet Lake Erie water quality criteria. Additionally, in its refutation of using TMDLs to restore Lake Erie's water quality, the Integrated Report states the following:

> The TMDL process does not provide additional authority to either Ohio or U.S. EPA to regulate nonpoint sources of pollution; Ohio's regulatory tools are limited to permits and enforcement actions against point sources of pollution.
> (Integrated Report, p. J-12).

This statement deserves close scrutiny. Certainly we agree that a TMDL does not confer "additional authority," rather it confers additional "responsibility" and a state's current authority is sufficient to control nonpoint source pollution. Specifically, the state can enact new rules, pass new laws and better enforce existing regulation in order to meet a TMDL. To be clear, the CWA requires states to adopt TMDLs, which are simply a statement of the amount of pollution the waters can receive in order to meet water quality standards. The CWA then requires states to adopt a "continuous planning process," to establish a project plan for returning the impaired waters to health. To be acceptable under the CWA, the

plan to meet a TMDL must provide "reasonable assurances" that it will be successful. While most often states rely on voluntary incentive programs to control agricultural nonpoint source pollution, numerous examples demonstrate this approach oftentimes is not sufficient. Unfortunately, states typically wait for plans to fail before adopting stronger measures, if they are adopted at all. So while it is correct that the TMDL portion of the CWA does not create any new state authority, it does require that states fully use their authority to regulate nonpoint sources as necessary to provide "reasonable assurances" that the state's approach will be successful. In other words, a state is perfectly free to use existing legislation, or to adopt new legislation, to regulate nonpoint sources if doing so is necessary to achieve the goals of its TMDL program.

The CWA provides the basis for programs related to nonpoint sources. When targets for improvement of an impaired water body are created through a TMDL, nonpoint source programs under the CWA can be specifically designed to address nonpoint source contributions to the impaired waterway. A TMDL allows those programs to have a target for necessary reductions in each nonpoint source category to meet target loadings. For example, the Chesapeake Bay TMDL addresses nonpoint sources through an accountability framework that guides restoration efforts using elements including watershed implementation plans (WIPs), two-year milestones, EPA's tracking and assessment of restoration progress and specific federal actions if jurisdictions do not meet their commitments. Some WIPs for the Chesapeake Bay TMDL are specific to county contributions.[3] For example, Maryland's WIP describes strategies for the county to include urban tree plantings, forest buffers, stormwater retrofits, impervious area reductions, stream restoration, abandoned mine reclamation, urban nutrient management, and street sweeping.

Looking at Ohio's regulatory tools, numerous opportunities exist to strengthen them or more fully enforce those currently in place. For example, Ohio's Agricultural Pollution Abatement Program rules covering the land application of manure requires adherence to the Natural Resource Conservation Service's 590 Nutrient Management Standards. For too long Ohio state agencies have interpreted this rule as mere guidance that only applies after mismanagement has polluted waters of the state or an investigation of a complaint verifies a violation. However, the rule is clear:

> Each owner, operator, animal manure applicator, or person responsible for land application of manure from an animal feeding operation **shall** minimize pollution from occurring on land application areas by following the standards in the "Field Office Technical Guide,...[4]
> (emphasis added, 901: 13-1-11(A))

The Field Office Technical Guide (FOTG) has unambiguous language such as the following standard:

> Nutrients from any source **must** not be surface-applied if nutrient losses offsite are likely. This precludes spreading on:
> • Frozen and/or snow-covered soils; and not
> • When the top 2 inches of soil are saturated from rainfall or snowmelt.
> • When there is a greater than 50% chance of rainfall of more than ½ inch within 24 hours.
> (emphasis added, NRCS 590 FOTG, p. 590-6)

[3] *See i.e.* Maryland's FINAL Phase II WIP for the Chesapeake Bay TMDL, July 2, 2012, Section III: Allegany County, *available at* http://www.mde.state.md.us/programs/Water/TMDL/TMDLImplementation/Documents/FINAL_PhaseII_Report_Docs/Final_County_WIP_Narratives/Allegany_WIPII_2012.pdf

[4] See section A under 901:13-1-11, Land application of animal manure.

In this example, a clear reading of the rule and FOTG together demonstrates manure applications are prohibited under these specified circumstances. In fact, this was true even before enactment of Senate Bill 1 and these protections remain in place statewide, as do all other 590 standards. Therefore Ohio EPA's assertion that available regulatory tools are limited to point sources is entirely false.

In sum, our point is that a TMDL and its implementation plan must include measures that will successfully restore beneficial uses and meet water quality criteria. Should they prove unsuccessful, then the states must implement stronger measures; failing to meet a TMDL is not an option. Of all the planning processes listed in the Integrated Report in chapter J3, "Addressing Nutrients in Lake Erie," only a TMDL and its implementation plan confers the statutory obligations for the state to take stronger action that goes beyond relying on voluntary measures. All others are merely aspirational plans with no regulatory backstop to ensure they are successful.

Regarding the state initiatives and GLWQA mechanisms to restore beneficial uses in Lake Erie, our organizations certainly support Ohio's commitment to reduce phosphorus entering western Lake Erie by 40 percent by 2025, and the process currently underway to establish Domestic Action Plans under the GLWQA Annex 4. We do not view these efforts as mutually exclusive of a western Lake Erie open water impairment designation or a U.S. EPA established Tri-State TMDL. In fact the TMDL should be incorporated as an adaptive management trigger in the Ohio Collaborative Implementation Plan (CIP), which would later be incorporated into the U.S. Domestic Action Plan. In this scenario, the CIP would include a provision directing Ohio to formally request U.S. EPA develop the Tri-State TMDL should monitoring show phosphorus reductions are not sufficient enough to meet the 40 percent reduction goal. ***Absent such a trigger written into the CIP, our organizations support U.S. EPA establishing the Tri-state TMDL.*** Such an approach would strengthen ongoing efforts and plans to restore Lake Erie's water quality and provide incentives for significant progress toward reducing phosphorus pollution.

Ohio Must Address the 2015 Ohio Supreme Court Ruling

The Integrated Report explains a Ohio's established TMDLs are "arguably invalidated" and all future TMDLs must go through the state's rulemaking process.

> On March 24, 2015, the Supreme Court of Ohio determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act. Ohio EPA must follow the rulemaking procedure in R.C. Chapter 119 before submitting a TMDL to U.S. EPA for its approval and before the TMDL may be implemented in an NPDES permit" (Fairfield Cty. Bd. of Commrs. v. Nally, 143 Ohio St.3d 93, 2015-Ohio-991. (Integrated Report, p. C-17)

Due to this ruling, the Integrated Report did not include any TMDLs scheduled past 2018, which creates significant uncertainty for when Ohio will restore water quality to all the impaired assessment units in the state. Our concern is highlighted by the Ohio EPA in its January 2016 letter to Regional Administrator Hedman [enclosed], where the Agency explained that delays in establishing Ohio's TMDLs "have a direct impact on Lake Erie and our overall strategy for reducing harmful algal blooms and other nutrient impacts on rivers and streams." Even more concerning is the status of all the TMDLs currently in place and the permitted discharge limits based on these TMDLs. As the Integrated Report points out, "the effect

of the Supreme Court's ruling is arguably invalidation of all the previously approved TMDLs." If the TMDLs are no longer valid, and the Integrated Report lacks no solution currently underway to address this critical situation, then it may be appropriate for U.S. EPA to administer Ohio's TMDL Program until such a time as Ohio lawmakers or the administration develop a permanent solution to this problem.

Conclusion

The impairment status of western Lake Erie's open waters needs a timely resolution. If Ohio EPA will not conduct the necessary analysis to determine impairment then the U.S. EPA must commit to do so. Should the U.S. EPA refuse, then the Ohio 303(d) list should be disapproved by U.S. EPA.Regardless of an open water impairment designation, a tri-state TMDL for total and soluble phosphorus may be necessary in order to restore water quality in the western Lake Erie shoreline and associated public drinking water intake assessment units. The Ohio EPA should support its establishment as part of the Collaborative Implementation Plan adaptive management trigger mechanism. Finally, we urge Ohio EPA to propose a solution in the final Integrated Report to the 2015 Ohio Supreme Court ruling that arguably invalidated all of the state's TMDLs.

Cordially,

Adam Rissien
Clean Water Director
Ohio Environmental Council

Molly M. Flanagan
Vice President, Policy
Alliance for the Great Lakes

Jill Ryan
Executive Director
Freshwater Future

Jennifer Miller
Director
Ohio Chapter of the Sierra Club

Jessica Dexter
Staff Attorney
Environmental Law & Policy Center

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

REPLY TO THE ATTENTION OF:

AUG 07 2015

WW-16J

Craig W. Butler, Director
Ohio Environmental Protection Agency
50 West Town Street
Columbus, Ohio 43215

Re: Ohio EPA's 2014 Integrated Report Section 303(d) List

Dear Mr. Butler:

The U. S. Environmental Protection Agency conducted a complete review of Ohio's 2014 Section 303(d) list and supporting documentation and information. Based on this review, EPA determined that Ohio's 2014 list of water quality limited segments still requiring Total Maximum Daily Load calculations meets the requirements of Section 303(d) of the Clean Water Act and EPA's implementing regulations. Therefore, EPA hereby approves Ohio's 2014 Section 303(d) list, along with the State's priority rankings for these waters and pollutants, with one exception as stated below.

EPA approves and supports Ohio's new listing of the shoreline of the Western Basin of Lake Erie for the Public Drinking Water Supply (PDWS) designated use impairment due to excess microcystin. EPA is deferring, however, its final decision on whether waters beyond the shoreline of the Western Basin of Lake Erie should be on Ohio's Section 303(d) list for the impairment of the PDWS designated use due to microcystin. EPA's deferral is due to proposed changes to Ohio's Lake Erie assessment units that would expand coverage to all drinking water intakes in the Western Basin of Lake Erie for the next listing cycle. The statutory and regulatory requirements, and EPA's review of Ohio's compliance with each requirement are described in the enclosed decision document.

We appreciate the timely submittal of the list. If you have any questions please contact Mr. Peter Swenson, Chief, Watersheds and Wetlands Branch, at 312-886-0236.

Sincerely,

Tinka A Hyde

Tinka G. Hyde
Director, Water Division

Enclosure

cc: Karl Gebhardt, OEPA
Melinda Harris, OEPA

DECISION DOCUMENT FOR THE PARTIAL APPROVAL OF OHIO'S SUBMISSION OF THE STATE'S INTEGRATED REPORT WITH RESPECT TO SECTION 303(d) OF THE CLEAN WATER ACT (CATEGORY 5 WATERS)

The U.S. Environmental Protection Agency has conducted a complete review of Ohio's 2014 Section 303(d) list and supporting documentation and information. Based upon this review, EPA has determined that Ohio's list of assessment units (AUs) still requiring total maximum daily loads (TMDLs) partially meets the requirements of Section 303(d) of the Clean Water Act (CWA or "the Act"), and EPA's implementing regulations, and hereby partially approves Ohio's list. Ohio's list of AUs still requiring TMDLs appears in Category 5 of the Ohio 2014 Integrated Water Quality Monitoring and Assessment Report (2014 Integrated Report or 2014 IR), and EPA's partial approval extends only to the AUs in Category 5 of the 2014 Integrated Report. The statutory and regulatory requirements, and EPA's review of Ohio's compliance with each requirement, are described in detail below.

EPA approves the new listing of the shoreline of Lake Erie for Public Drinking Water Supply (PDWS) designated use impairment due to excess microcystin. EPA, however, is deferring its final decision on whether the waters beyond the shoreline AU of the Western Lake Erie Basin (WLEB) should be on Ohio's Section 303(d) list for impairment of the PDWS designated use due to microcystin. Sampling results from water intakes for Toledo and Oregon, which are located beyond the shoreline AU of the WLEB, exceed Ohio's microcystin threshold. Ohio's Section 303(d) list includes the shoreline of the WLEB for the PDWS designated use, but does not include the waters beyond the shoreline AU where the Toledo and Oregon intakes are located. EPA's deferral is limited to the assessment status of microcystin impacts to the PDWS use in the waters beyond the shoreline AU of the WLEB. EPA's deferral is due to proposed additions to Ohio's Lake Erie AUs that would expand coverage to all drinking water intakes in the WLEB for the next listing cycle.

I. Statutory and Regulatory Background

Identification of Water Quality Limited Segments (WQLSs) for Inclusion on Section 303(d) List

Section 303(d)(1) of the Act directs states to identify those waters within its jurisdiction for which effluent limitations required by Section 301(b)(1)(A) and (B) are not stringent enough to implement any applicable water quality standard, and to establish a priority ranking for such waters, taking into account the severity of the pollution and the uses to be made of such waters. The Section 303(d) listing requirement applies to waters impaired by point and/or nonpoint sources, pursuant to EPA's long-standing interpretation of Section 303(d).

EPA's implementing regulations require states to submit biennially a list identifying water quality limited segments still requiring a Total Maximum Daily Load (TMDL) (40 C.F.R. § 130.7(b)(1)). EPA regulations provide that states do not need to list waters where the following controls are adequate to implement applicable standards: (1) technology-based effluent limitations required by the Act; (2) more stringent effluent limitations required by state or local authority; and (3) other pollution control requirements required by state, local, or federal authority (40 C.F.R. §130.7(b)(1)).

Consideration of Existing and Readily Available Water Quality-Related Data and Information

In developing Section 303(d) lists, states are required to assemble and evaluate all existing and readily available water quality-related data and information, including, at a minimum, consideration of existing and readily available data and information about the following categories of water: (1) waters identified as partially meeting or not meeting designated uses, or as threatened, in the state's most recent Section 305(b) report; (2) waters for which dilution calculations or predictive models indicate nonattainment of applicable standards; (3) waters for which water quality problems have been reported by government agencies, members of the public, or academic institutions; and (4) waters identified by the state as impaired or threatened in a nonpoint assessment submitted to EPA under Section 319 of the Act. (40 C.F.R. §130.7(b)(5)) In addition to these minimum categories, states are required to consider any other data and information that is existing and readily available. EPA's 1991 Guidance for Water Quality-Based Decisions (1991 Guidance), describes categories of water quality-related data and information that may be existing and readily available. While states are required to evaluate all existing and readily available water quality-related data and information, states may, subject to EPA approval, decide to rely or not rely on particular data or information in determining whether to list particular waters.

In addition to requiring states to assemble and evaluate all existing and readily available water quality-related data and information, EPA regulations require states to include, as part of their submissions to EPA, documentation to support decisions to list or not list waters. Such documentation must include, at a minimum, the following information: (1) a description of the methodology used to develop the list; (2) a description of the data and information used to identify waters; (3) a rationale for any decision to not use any existing and readily available data and information; and (4) any other reasonable information required by the Region (40 C.F.R. §130.7(b)(6)).

Priority Ranking

EPA regulations also require states to establish a priority ranking for listed waters. In prioritizing and targeting waters, states must, at a minimum, take into account the severity of the pollution and the uses to be made of such waters and shall identify the pollutants causing or expected to cause violations of the applicable water quality standards. The priority ranking must specifically include the identification of waters targeted for TMDL development in the next two years (40 C.F.R. §130.7(b)(4)). States may consider other factors relevant to prioritizing waters for TMDL development, including immediate programmatic needs, vulnerability of particular waters as aquatic habitats, recreational, economic and aesthetic importance of particular waters, degree of public interest and support, and state or national policies and priorities (57 Fed. Reg. 33040, 33045 (July 24, 1992) and EPA's 1991 Guidance).

Identification of Waters and Consideration of Existing and Readily Available Water Quality-Related Data and Information

The Ohio 303(d) list of prioritized impaired waters (i.e., Category 5 of the 2014 Integrated Report) is contained in Section L4 of the 2014 Integrated Report, and is in compliance with Section 303(d) of the Act and 40 C.F.R. §130.7. EPA has reviewed Ohio's description of the data and information it considered, its methodology for identifying waters, and considered any other relevant information including information the State submitted to EPA in response to requests for additional information.

Ohio's Lake Erie assessment included drinking water use, and Ohio assembled and evaluated microcystin data from drinking water intakes within the shoreline AUs and further from the shoreline AU of the WLEB, including intakes for Toledo and Oregon. Though EPA concludes that the State of Ohio properly assembled and evaluated all existing and readily available data and information relating to the categories of waters specified in 40 C.F.R. §130.7(b)(5), EPA is deferring its final decision on Ohio's decision not to include the waters beyond the shoreline AU of the WLEB on its 2014 Section 303(d) list for the PDWS designated use. EPA's deferral is due to proposed additions to Ohio's Lake Erie AUs that would expand coverage to all drinking water intakes in the WLEB for the next listing cycle. EPA is only deferring action on assessment determinations related to microcystin impacts to the PDWS use for the open waters of the WLEB. As detailed later in this document, EPA is working with Ohio EPA to ensure that any waters impaired for the PDWS use within the three new proposed AUs for the WLEB (i.e., shoreline, nearshore, and offshore) are included on the State's future 303(d) lists.

EPA has also determined that the State properly listed waters with nonpoint sources causing or expected to cause impairment, consistent with Section 303(d) of the Act and EPA guidance. Section 303(d) lists are to include all water quality limited segments (WQLSs) still needing TMDLs, regardless of whether the source of the impairment is a point and/or nonpoint source.

EPA's long-standing interpretation is that Section 303(d) applies to waters impacted by point and/or nonpoint sources.[1]

Ohio has provided its rationale for not relying on particular existing and readily available water quality-related data and information that it has evaluated as the basis for listing waters. Specifically, in 2003, Ohio passed a credible data law, in the Ohio Revised Code (ORC) 6111.50 to 6111.56, that establishes requirements for the use of external data. That law requires the Director of Ohio EPA to adopt rules that would, among other things, require that data be collected by a qualified data collector and be compliant with the specifications of "Level 3 credible data," in order to be used for listing waters under Section 303(d). Those rules, effective March 24, 2006, are located at Chapter 3745-4 of the Ohio Administrative Code (OAC). Within Section D5 of the 2014 Integrated Report is the memorandum dated May 23, 2013, sent by Ohio to solicit Level 3 data from external sources and all Level 3 Qualified Data Collectors (QDC). External sources include State and County health departments, universities, U.S. Geological Survey, Northeast Ohio Regional Sewer District (NEORSD), permittees, compliance databases, and atrazine registrants. The data collectors either received intensive training and certification from Ohio EPA to become QDC, or the entities have submitted data in the past. EPA concludes Ohio has provided a reasonable basis for not relying on data that do not meet the aforementioned criteria for assessment purposes.

As part of its ongoing monitoring and assessment program, the State developed a five-year rotating basin plan that divides the State into 25 areas, each comprised of a group of subbasins within major river basins. Ohio EPA estimates that under the current funding levels monitoring takes more than 10 years to complete throughout the State. After the State completes the monitoring in one of the assessment areas, it collects the data and assesses the biological, chemical, and physical condition of the AU.

The Ohio River data collection is through the Ohio River Valley Water Sanitation Commission (ORSANCO). ORSANCO was established in 1948 and operates programs to improve water quality (through wastewater discharge standards, biological assessments, monitoring chemical and physical properties), coordinates emergency response for spills or accidental discharges, and promotes public participation in volunteer programs. Ohio defers to ORSANCO's analysis and listing of impaired Ohio River segments, as discussed in greater detail later in this document.

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1 See Pronsolino v. Nastri, 291 F. 3d 1123, 1131 (9th Cir. 2002); see also EPA's 1991 Guidance; and National Clarifying Guidance for 1998 Section 303(d) Lists, August 27, 1997.

II. Analysis of Ohio's Submission

Listing Methodology and Reporting

EPA issued guidance for integrating the development and submission of Section 305(b) water quality reports and Section 303(d) lists of impaired waters (EPA's 2002 Integrated Water Quality Monitoring and Assessment Report Guidance, November 19, 2001) (2001 Guidance). The 2001 Guidance was superseded by EPA's Guidance for 2004 Assessment, Listing and Reporting Requirements Pursuant to Sections 303(d) and 305(b) of the Clean Water Act, July 21, 2003 (2003 Guidance). The 2003 Guidance recommends that states develop an integrated report of the quality of their waters by placing all waters into one of five assessment categories. On August 12, 2005, the 2006 Integrated Report Guidance (2006 IRG) became available. A memorandum dated October 12, 2006, from the Office of Wetlands, Oceans, and Watersheds, encouraged states and EPA regional offices to follow the 2006 IRG in preparing and reviewing the 2008 Section 303(d) lists. In addition to the 2006 IRG, EPA has issued supplemental memoranda and guidance including: i) a memorandum dated May 5, 2009; ii) *Information Concerning 2012 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions*, dated March 21, 2011; and iii) *Information Concerning 2014 Clean Water Act Sections 303(d), 305(b), and 314 Integrated Reporting and Listing Decisions*, dated September 3, 2013. These memoranda and guidance were available for the preparation and review of Ohio's 2014 Integrated Report.

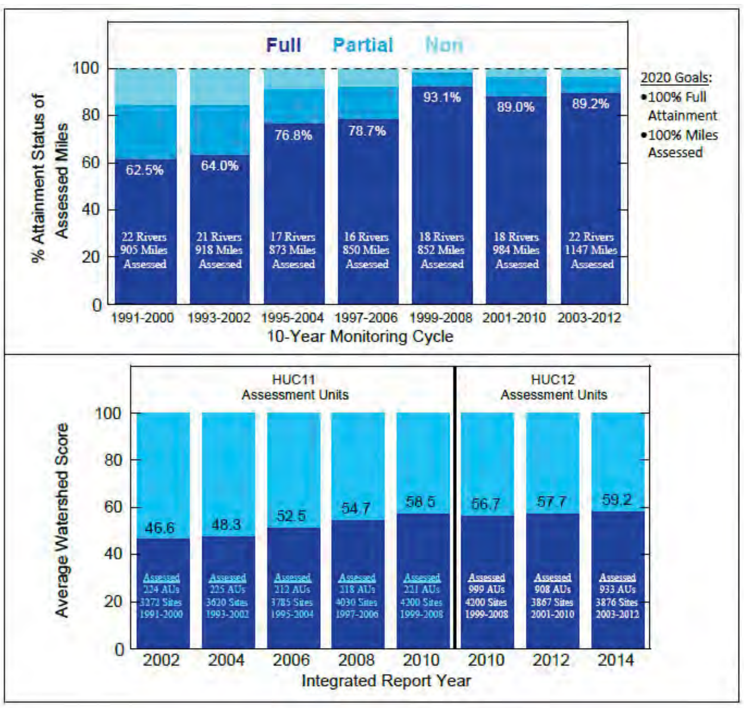
The waterbodies in Category 5, at Section L4 of Ohio's 2014 IR, constitute Ohio's Section 303(d) list. Ohio's 2014 IR discusses several issues that impact Ohio's assessment program. Details are found within Ohio's 2014 IR, and several changes to Ohio's assessment program for the 2014 listing cycle are highlighted and discussed below. The most significant overall additions and enhancements to the 2014 IR include the listing of the shoreline AU of the WLEB for the PDWS designated use based on microcystin data. The listing methodology for the PDWS designated use includes the assessment of a new core indicator based on algae and cyanotoxins in the shoreline AUs in Lake Erie. The 2014 IR also includes a section on Lake Erie monitoring and assessment, and an expanded wetlands discussion. Several sections of the 2014 IR are not discussed in this document because there was no significant departure from past monitoring and assessment practices.

<u>Section A of the 2014 IR: An Overview of Water Quality in Ohio.</u> This Section assesses the changes in status of Ohio's waters since the last listing, including progress toward overall goals. One of the goals of Ohio's surface water program is to assess all large rivers (23 rivers in 38 AUs) and have those waters attain applicable water quality goals by 2020. The most recent ten year interval can be readily compared with the 2012 IR (for 18 large rivers). The top figure below represents the attainment status of the large rivers. A total of 89.2% of the assessed miles of large rivers are in full attainment, which is very similar to the last reporting cycle and

represents all data for all rivers from 2003-2012.

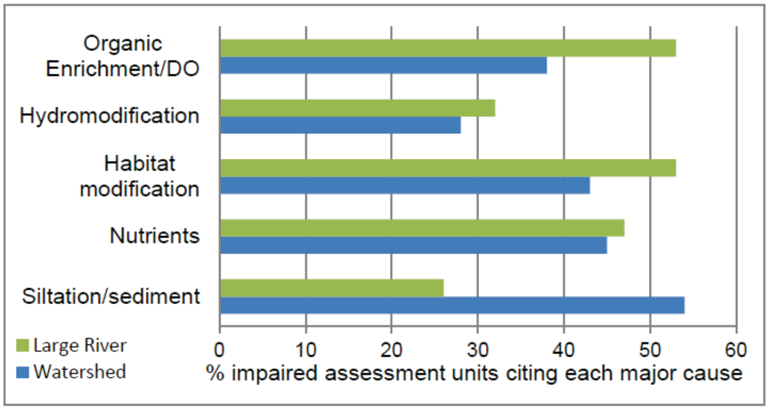
The bottom figure below represents the overall percentages of the watershed AUs (WAUs), found on page A-6, Section A of Ohio's 2014 IR submittal. A total of 59.2% of the 933 assessed AUs are in full attainment, a similar value compared to the last listing cycle (3,876 sites). These assessments are further discussed and compared in the Section G review later in this document.

Summary information on the individual AUs is available at: http://wwwapp.epa.ohio.gov/gis/mapportal/IR2014.html



(Graphs from page A-6, Section A of Ohio's 2014 IR)

The major causes of impairment are organic enrichment/low dissolved oxygen (OE/DO), hydromodification, habitat modification, nutrients, and siltation/sediment. The figure below shows that prevalence of OE/DO impairment in both watershed assessment units and large rivers. The figure below is taken from page A-7, Section A of the 2014 IR. Ohio includes a brief summary of causes and sources as described below.



(Graphs from page A-7, Section A of Ohio's 2014 IR)

- Organic enrichment occurs as living organisms increase, then decompose and deplete oxygen supplies.
- Sediment/siltation includes deposition of fine soil particles, usually after high flow events as erosion and runoff occur, and sediment can transport other pollutants. Low flows deposit sediment and can degrade habitat for aquatic life.
- Nutrient enrichment is primarily due to phosphorus and nitrogen. Though these nutrients are not toxic, they affect the habitat by promoting excess algal growth, and the subsequent decay of algae that depletes oxygen for other organisms. Harmful Algal Blooms (HABs) may:
  - Introduce toxins into the water (e.g. microcystin)
  - Cause taste and odor problems in drinking waters,
  - Pollute beaches and surface waters with scum,
  - Reduce oxygen for fish and other animals,
  - Cause processing problems for public water supply,
  - Generate toxic chemicals.
- Habitat modification refers to manmade changes of a stream's natural channel for the purpose of improving drainage. The channel may be straightened, widened, or deepened, and the stream loses its function as an ecosystem or its ability to naturally process water pollutants.
- Hydromodification is flow alteration that may be due to stream impoundment, increased peak flow from urbanization, or water table regulation through sub-surface drainage. Current or flow changes may result and negatively affect the habitat.
- Pathogen contamination may be from human or animal waste that is conveyed to a stream and is a human health issue from skin contact or ingestion.

Section C of the 2014 IR: Managing Water Quality. This Section describes various surface water quality management programs and actions in Lake Erie, especially in the Western Basin, including active programs described in Section C of the 2014 IR. These efforts include the ongoing Remedial Action Plans (RAPs) in the Areas of Concern (AOCs) in the Maumee, Black, Cuyahoga and Ashtabula Rivers, all of which flow into Lake Erie. There are environmental restoration projects for these tributary rivers being implemented and funded under the Great Lakes Restoration Initiative (GLRI) and the Great Lakes Legacy Act (GLLA), to reduce nutrient loadings, including phosphorus, to the WLEB, remove contaminated sediments, restore habitat, remove dams, and other water-quality related efforts, with the ultimate goal of reducing the Beneficial Use Impairments (BUIs) for the AOCs.

The Lake Erie Lakewide Action and Management Plan (LAMP), formerly the Lakewide Management Plan (LaMP), and the RAPs are both focused on loading reduction and restoration of beneficial uses, using an ecosystem approach. The Great Lakes Water Quality Agreement (GLWQA) between the United States and Canada (amended in 2012), recognizes and describes the actions that will be taken through the LAMP and RAPs. Annex 2 of the GLWQA addresses lakewide management for each of the Great Lakes and includes development of nearshore monitoring to support a more integrated nearshore monitoring framework. Annex 4 addresses nutrient target development and loading reduction plans, and the monitoring will support the ecosystem objectives[1]; Annex 7 provides a framework for native species and habitat protection.

Ohio EPA is actively monitoring Lake Erie, having initiated a *Comprehensive Nearshore Monitoring Program* in 2011 that will continue for several years using GLRI funding. Additional ambient sites and parameters, and greater evaluation of biological communities were based on the framework from the 2010 National Coastal Condition Assessment. The Ohio Lake Erie Phosphorus Task Force Phase 2 received GLRI funding in 2011 and revisited reduction targets and developed management recommendations. Future work will also extend beyond the shoreline to include harbors, bays, and estuaries, and will evaluate biological communities at various trophic levels. Intensive nearshore monitoring was completed in 2013, and includes a three-year monitoring design; the results from the first two years of this monitoring are included in the 2014 Integrated Report.

Ohio's Nonpoint Source (NPS) Program has several GLRI projects on creeks and rivers in watersheds that flow into Lake Erie, including the WLEB, or in headwaters that are part of watersheds that eventually flow to the Lake. The NPS Program is also now overseeing Ohio's Lake Erie Program, tracking implementation of RAPs, nearshore monitoring, and development and implementation of the Lake Erie LAMP.

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[1] Under Annex 4, a loading target for phosphorus will be developed in 2015 for Lake Erie, followed by a load reduction plan in 2016 that will allocate phosphorus loadings between the United States and Canada.

The Section also discusses Ohio's Section 401 Certification. The CWA establishes state certification as part of the permitting process. Ohio may review and then certify, conditionally certify, or deny water quality certification for Federal permits or licenses that might result in a discharge to its waters, including wetlands. In the Ohio Administrative Code (OAC), rules for the 401 review process are found in Section 3745-1-05 (Stream Antidegradation), 3745-1-50 through 54 (Wetland Water Quality Standards), and 3745-32-01 through 07 (Water Quality Certification). Ohio's regulations require applicants to provide three alternatives for each proposed project: a preferred, minimal degradation, and non-degradation alternative. These alternatives are considered to minimize impacts on current aquatic resources and evaluate future mitigation. After review, Ohio will determine the best alternative. Ohio encourages permit applicants to coordinate in advance, as well as include 10 specific items within the 401 application before review may begin.

Section D of the 2014 IR: Framework for Reporting and Evaluation – Ohio continues to use the watershed orientation from previous reports and a framework for assessment of Aquatic Life, Recreation, Human Health, and Public Drinking Water Supply (PDWS) designated uses. The AUs for the 2014 IR have not changed significantly from the 2012 IR. The three types of AUs are: Watershed Assessment Units (WAU) for the streams, Large River Assessment Units (LRAU) for the large rivers, and Lake Erie is assessed in three units, the nearshore western basin, the nearshore central basin, and the Lake Erie Islands. Inland lake assessments and listings are within the WAU framework. Reporting and evaluation are completed by the Ohio EPA and outside entities that are certified as Level 3 qualified collectors, described previously in this document. Data may be chemical, physical, or biological. Ohio defers to ORSANCO for the Ohio River listings.

Public involvement is a large component of Ohio's listing framework. Of greatest public interest and concern in this listing cycle are the excessive algal blooms in the WLEB, as expressed in the public comment letters included in Section D. Ohio's responses show that it is taking actions that include monitoring, data assessment, and the listing of the shoreline of the WLEB for impairment of the PDWS use. Ohio has solicited comments on the proposed revision of Lake Erie sampling locations and methods, and the expansion of AUs to include Shoreline, Nearshore, and Offshore AUs for the Western, Sandusky and Central Basins, and an Islands Shoreline AU. EPA has reviewed Ohio EPA's responses to the comments it received, and finds Ohio EPA's responses to be reasonable.[2]

Comments were also submitted regarding wetlands, drinking water, mussels, and ammonia; EPA reviewed Ohio EPA's responses to the comments and finds that the comments are adequately addressed. Many comments regarding adequacy of E. coli data collection in streams and rivers came in to Ohio EPA's Division of Surface Water via webmail and were reasonably addressed.

[2] EPA, however, is deferring its decision regarding Ohio EPA not listing the waters beyond the shoreline AU of the WLEB for impairment of the PDWS use, as discussed in detail in Section H below.

Section E of the 2014 IR: Evaluating Beneficial Use – Human Health (Fish Contamination). Ohio has human health water quality standards to protect the public from adverse impacts of contaminants found in drinking water and consumption of contaminated fish. Evaluation of public drinking water supply use is addressed separately in Section H below. Fish contamination as it affects human health (in Section E of the 2014 IR) is addressed through six contaminants which may bioaccumulate in fish tissue. Ohio measures the fish tissue concentration to determine whether exceedance of concentration values trigger a fish consumption advisory (FCA). Parameters for WQS and FCA are not the same because different assumptions are used in calculating fish consumption rates for fish advisories compared to calculating water quality standards. Standard development for water and its relationship to FCA is fully discussed in the Standards Section – Human Health, later in this document. EPA has concluded that Ohio has identified all the waters not attaining human health uses due to excess contaminants in fish tissue.

Section F of the 2014 IR: Evaluating Beneficial Use - Recreation. The LRAU, WAU, inland lakes, and shoreline AU for the Lake Erie Basin (Western, Central and Lake Erie Islands) were evaluated for recreational use. Table F-1, later in the standards section of this document, shows that water quality standards are based on the amount of human contact with the various waterbody types, i.e., bathing water, primary contact waters and secondary contact waters. *E. coli* standards are expressed as a seasonal geometric mean of 126 cfu/100ml during the recreational season; the single sample maximum is 235 cfu/100ml.

Section F of the 2014 IR states that Lake Erie beach advisories for each beach are based on "… exceedance of the single sample maximum *E. coli* criterion for beaches of 235 cfu/100 ml. This is the threshold that triggers the issuance of beach advisories, and has been used since 2006. Use of the single sample maximum *E. coli* criterion for the purpose of issuing beach advisories complies with the federal BEACH Act rule (*Water Quality Standards for Coastal and Great Lakes Recreation Waters*, 69 FR 67217, November 16, 2004), which became effective on December 16, 2004." (2014 IR, F-9) This value is also used by health departments. Whenever this threshold was exceeded more than 10% of the recreational season from late May through early September, Ohio listed the Lake Erie beach as being in non-attainment (Table F-2 below). Section F also has tables that provide an overview of the various assessments for determining recreational use impairment for Lake Erie beaches.

Table F-2. Determining assessment status of Lake Erie shoreline AUs.

Lake Erie AU Assessment Status	Attainment Status of Individual Beaches
Full	Frequency of advisory postings less than 10% of recreation season for all of the beaches in the AU for all years assessed
Non	Frequency of advisory postings more than 10% of recreation season for one or more of the beaches in the AU for one or more of the years assessed

Table F-10 below shows the 63 Lake Erie beaches divided into the three geographical areas. The recreational season closings and the percentage of days in exceedance of *E. coli* from 2008-2012 are shown to be 15.9% of recreation days closings for the Western Basin, 21.8% for the Central Basin, and 1.1% for the Lake Erie Islands. Though this table provides an overall picture based on a compilation of data, there is great variation in the frequency of advisories and bacteria levels depending on data analysis (whether the seasonal geometric mean or the single sample maximum was exceeded). Further, there are great differences amongst: individual beaches; different seasons at the same beach; and the number of seasons used in the analysis.

Table F-10. Bathing water geometric mean *E. coli* exceedance frequency at 64 Lake Erie public beaches from 2008-2012 (pooled by Lake Erie AU to report use support).

	Western Basin	Central Basin	Lake Erie Islands
Number of beaches	15	47	2
Total recreation days	7,368	24,819	903
Total days in exceedance	1,171	3,731	10
Percentage of days in exceedance	15.9%	21.8%	1.1%
Average # of days *E. coli* criteria exceeded per beach per season[1]	15.6	17.6	1.0
Attainment status	Does not support	Does not support	Full support

[1]Calculated by dividing the total days in exceedance in a basin by the total number of beach seasons in the basin. The total number of beach seasons in a basin is equal to aggregated sum of the total number of beaches for which monitoring was conducted during each season for the 2008-2012 reporting period.

Table F-12 below shows the trend for the 2014 listing cycle compared to 2012 for rivers and streams in WAUs. For the 680 AUs analyzed for the 2014 report, 19% fully supported recreational use while 81% did not.

Table F-12. Overall differences in the assessment of recreation use attainment, 2010-2014.

	2010 Report		2012 Report		2014 Report	
	Number	Percent	Number	Percent	Number	Percent
Total AUs	1,576	100	1,576	100	1,576	100
Assessed	487	31	588	37	680	43
Not Assessed	1,089	69	988	63	896	57
Supporting Recreation Use	65	13[a]	88	15[a]	130	19
Not Supporting Recreation Use	422	87[a]	500	85[a]	550	81

[a] Note: The percentage of AUs reported as supporting the recreation use and not supporting the recreation use are based on the total AUs that were assessed (e.g., 487 in the 2010 analysis).

Beaches at inland lakes are tested less frequently compared to Lake Erie beaches, and are not exceeding the bacteria limits as frequently as Lake Erie. The overall frequency of exceedances at inland lakes was 10.5% in a five year interval. The main exception was the inland lake Grand Lake St. Marys, where over 60% of the samples collected during the 2010 recreation season exceeded the single sample criterion. Ohio recommends more beach sampling at recreational locations where beach managers know that exceedances may cause harm via human contact with the water through bathing or swimming, and can adequately inform the public. EPA concurs with Ohio's listing of recreational use impairments.

Section G of the 2014 IR: Evaluating Beneficial Use – Aquatic Life Use (ALU). Table G-1 on the following page indicates that overall the WAUs achieving ALU changed slightly from 57.7% to 59.2% for the HUC 12 assessments (shown in the Figure in Section A above). Overall, the LRAUs achieving ALU changed from 89.0% to 89.2%, and the three Lake Erie AUs show that 13.2% of the sites are in full attainment for ALU. GLRI funding was used for the Lake Erie nearshore monitoring and assessment in this IR. Lake Erie sampling occurred using 91 fish community collections at 38 sites in 2011-2013. In Table G-1 below, the decrease in full attainment in Lake Erie AUs (from 30.4% in 2012 to 13.2% in 2014) appears significant when compared to the last listing cycle. This change occurred because data were severely restricted for the 2012 cycle due to outdated data from 1999 - 2000 being excluded; only 2001 – 2002 data were used to evaluate in the 2012 cycle. The current cycle impairment values are not significantly different than previous cycles using10 years of data (e.g., 14.7% in full attainment in 2010). EPA concurs with Ohio's listing of aquatic life use impairments.

Table G-1. Summary of aquatic life use assessment for Ohio's watershed[1], large river, and Lake Erie assessment units: 2002-2014 Integrated Report cycles.

IR Cycle	2002 (1991-2000)	2004 (1993-2002)	2006 (1995-2004)	2008 (1997-2006)	2010 (1999-2008)	2012 (2001-2010)	2014 (2003-2012)
HUC11 Watershed AUs (331)							
No. AUs Assessed (% of total)	224 (68%)	225 (68%)	212 (64%)	218 (66%)	221 (67%)	-	
No. Sites Assessed	3272	3620	3785	4030	4200	-	
Average AU Scores							
Full Attainment	46.6	48.3	52.5	54.7	58.5	-	
Partial Attainment	25.2	23.6	22.6	22.4	21.2	-	
Non-Attainment	28.2	28.1	24.9	22.9	20.3	-	
HUC12 Watershed AUs (1538)							
No. AUs Assessed (% of total)[2]	-	-	-	-	999 (65%)	908 (59%)	933 (61%)
No. Sites Assessed	-	-	-	-	4200	3867	3876
Average AU Score[3]	-	-	-	-	56.7	57.7	59.2
% Sites Full Attainment	-	-	-	-	55.1	57.0	57.8
% Sites Partial Attainment	-	-	-	-	20.0	21.6	22.3
% Sites Non-Attainment	-	-	-	-	24.9	21.4	19.9
Large River AUs (23 rivers/38 AUs totaling 1247.54 Miles)							
No. Rivers/AUs Assessed	22	21	17	16	18/30	18/31	22/37
No. Sites Assessed	422	425	374	278	265	312	332
No. Miles Assessed (% of total)	905 (70%)	918 (71%)	873 (68%)	850 (66%)	852 (69%)	984 (80%)	1147 (92%)
% Miles Full Attainment	62.5	64.0	76.8	78.7	93.1	89.0	89.2
% Miles Partial Attainment	23.0	21.4	15.1	13.9	5.5	7.5	6.3
% Miles Non-Attainment	14.5	14.6	8.1	7.4	1.4	3.5	4.5
Lake Erie AUs (3)							
No. AUs Assessed	3	3	3	3	3	3	3
No. Sites Assessed[4]	92	111	93	49	34	23	38
% Sites Full Attainment	12.0	18.0	19.4	10.2	14.7	30.4	13.2
% Sites Partial Attainment	13.0	14.4	16.1	22.4	17.7	30.4	34.2
% Sites Non-Attainment	75.0	67.6	64.5	67.4	67.6	39.2	52.6

1 WAUs for the IR 2002-2010 cycles were based on HUC11s; WAUs transitioned to HUC12s for cycles beginning with 2010.
2 2010 statistics based on direct assessment of HUC12 AUs with data collected between 2005 and 2008 (n=545) and HUC11 extrapolated assessment of HUC12 AUs with data collected between 1998 and 2004 (n=454). 2012 and 2014 assessments based on direct assessment of HUC12 AUs with data collected between 2001 and 2010 (n=908) and 2003 and 2012 (n=933), respectively.
3 Statistic based on the average of available AU scores with current data, derived as explained in Section G2.2.
4 Data for sites used in the 2002-2012 IR cycles were generally collected between 1993 and 2002; for the 2014 IR, data were collected 2011-2013.

<u>Section H of the 2014 IR: Evaluating Beneficial Use: Public Drinking Water Supply.</u> Ohio has, for the first time, assessed and listed the shoreline of the WLEB for the PDWS use due to microcystin levels measured above threshold values of 1 µg/L. EPA commends Ohio for expanding its PDWS assessment to include microcystin, and supports Ohio's listing of the shoreline AU of the WLEB for impairment of the PDWS use based on microcystin.

EPA is deferring its final decision on the Section 303(d) listing status of the waters beyond the shoreline AU of the WLEB for impairment of the PDWS use. EPA's deferral is limited to the impairment status of the waters beyond the shoreline AU of the WLEB related to microcystin impacts to the PDWS use. In the next listing cycle, Ohio has proposed to expand the number and boundaries of the AUs for Lake Erie to include shoreline, nearshore, and offshore AUs, and would cover all drinking water intakes in the Western Basin of Lake Erie for the next listing cycle. .

For the 2014 IR, Ohio EPA used chemical water quality data from 2008 to 2012 to assess waters designated for PDWS use. The PDWS use is assessed within 500 yards of active drinking water intakes and on all publicly owned lakes. (See Table D-2, 2014 IR) Between 2010 and 2012, Ohio EPA collected 487 raw and finished drinking water cyanotoxin samples, and public water system providers submitted results for an additional 455 cyanotoxin samples. Ohio EPA reports that of these samples only one finished (i.e., treated) drinking water sample contained microcystin above the 0.3 ug/L reporting limit, but that sample was also below Ohio's drinking water threshold.

As mentioned above, Ohio EPA assessed and listed the shoreline AU of the WLEB, the only AU Ohio EPA listed on its 2014 303(d) list for impairment of the PDWS use based on microcystin. The 2014 listing cycle is the first time Ohio EPA used an algal toxin indicator to assess the Lake Erie shoreline AUs for impairment of the PDWS use. As part of its May 2013 Public Water System Harmful Algal Bloom Response Strategy, Ohio EPA selected the World Health Organization (WHO) provisional threshold of 1 µg/L for microcystin-LR as the algal toxin indicator. Based on data showing that at least two raw samples exceeded the 1 µg/L threshold at five drinking water intakes in the WLEB, Ohio EPA listed the WLEB shoreline as impaired for the PDWS use. Two of the five drinking water intakes from which data were evaluated are located outside of Ohio's current boundary for the shoreline AU. The two intakes outside the shoreline AU are the Toledo and Oregon intakes. Even though Ohio did not include the location of these two intakes on its Section 303(d) list, Ohio EPA based its listing of the shoreline AU as impaired for the PDWS use on microcystin data from the Toledo and Oregon intakes and intakes located within the physical boundary of the shoreline AU as described in Sections H.3 and H.4 of the 2014 IR. In response to questions from EPA about listing the open waters of the WLEB based on the location of the Toledo and Oregon intakes, Ohio stated that as part of its 2016 IR, it expects to "present a final expanded set of AUs and be able to provide a more complete analysis (and possibly 303(d) listings where appropriate) for the PDWS and human health uses (based on fish tissue) for the open waters of Lake Erie." (Letter from OEPA to EPA dated May 28, 2014.) Finally, Ohio EPA stated that in the interim it is working to address problems in Lake Erie through nutrient TMDLs on tributaries, initiatives to reduce nutrient loads, and other Great Lakes Water Quality Agreement efforts, including active participation in developing a phosphorus target for Lake Erie under Annex 4 to the Agreement.

EPA is deferring final action on the listing status of the waters beyond the shoreline AU of the WLEB for the PDWS use in order to continue to consider the outcome of Ohio's efforts to advance the assessment and listing of Lake Erie waters impaired for the PDWS use. Ohio's proposed AUs include a shoreline, nearshore and offshore AUs for the WLEB, and EPA expects Ohio EPA to evaluate and assess all readily available microcystin data for the next listing cycle, and to list any AUs where existing and readily available data shows an impairment of the PDWS use.

<u>Section I of the 2014 IR: Considerations for Future Lists.</u>

<u>Lake Erie PDWS</u>

In Section I, subsection I 5.2.2 (Defining Assessment Units) of its IR, Ohio EPA describes proposed changes to future assessments to include a total of ten AUs for Lake Erie. The proposed Lake Erie AUs are the shoreline, nearshore, and offshore for the Western, Sandusky and Central Basins, and the Islands shoreline, at depths as shown in Figure I 5-1 below. Because the Western and Sandusky Basin are relatively shallow, the boundary between the nearshore and offshore AUs in those basins is the seven meter depth contour, while the cutoff for the Central Basin is the 15 meter depth contour.

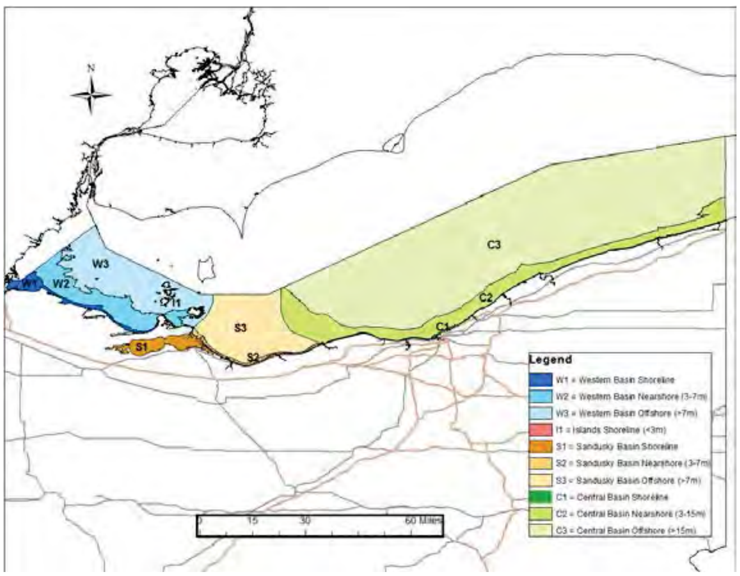


Figure I 5-1. Proposed Ohio Lake Erie Assessment Units

Section I, subsection I.5.2.3, of the 2014 IR discusses sources of data and the Ohio Credible Data Law 2003 (ORC 6111.50 to 6111.56). Ohio EPA states that when making attainment determinations it relies upon data certified as Level 3 data, and that the only currently available Level 3 data are from Ohio EPA ambient monitoring stations and from the Northeast Ohio Regional Sewer District. Ohio EPA expects that Level 3 data will be available from other sources in the future, including EPA data that was collected in 2014, and will be collected annually, by the R/V Lake Guardian. EPA will coordinate with Ohio EPA and expects Ohio EPA to fully assess the ten AUs for Lake Erie and to assemble and evaluate all existing and readily available data, including EPA data, for the 2016 integrated report and listing cycle.

Algae
EPA notes that Ohio has not assessed Lake Erie with respect to the State's narrative criteria at OAC 3745-01-04(E), prohibiting, among other things, nuisance growths of algae created by nutrients entering the water as a result of human activity. Given the prevalence of HABs in the WLEB, in EPA's April 15, 2014 letter to OEPA, EPA encouraged Ohio to develop a methodology for assessing for attainment of the nuisance algal growth narrative water quality criteria. Ohio responded in a letter on May 28, 2014 that it would consider those methods that meet its requirement for credible data, and that biomass may be used once a reliable method is established and accepted. Finally, in its future assessment of the new Lake Erie AUs, EPA requests that Ohio consider the impacts of HABs and nuisance algal growth on aquatic life use, in addition to the impacts on recreational use.

HABs are increasing spatially and temporally in this country and around the world. HABs produce cyanotoxins that affect the skin, liver or nervous system, and can deplete oxygen levels for aquatic life due to biomass from excessive algal blooms. These algae are very adaptable to many water conditions and may experience rapid growth, especially when excess phosphorus is introduced to a water body. The cyanotoxins are recognized to be a hazard to humans, animals, and ecosystems by many agencies, including the EPA, the Center for Disease Control, and the WHO. The WHO has developed risk-based thresholds for microcystin, anatoxin-a, cylindrospermopsin, and saxitoxin for adults for recreation and drinking water uses. Ohio EPA is using the same thresholds for determining impairment to drinking water, but focused only on microcystin in this listing cycle.

In 2011 Ohio released a strategy to protect people from the toxins in public recreational waters. Advisories are posted when there may be a risk for human health and illness. Eight State Park lakes and three Lake Erie beaches had advisory postings in 2012, as did Buckeye Lake beaches, Maumee Bay, and Euclid Beach; Grand Lake St. Marys was posted with advisories for 100% of the 2012 recreational season. There were three reports of human illness in 2011 and 2012, and one dog death in 2011 for Grand Lake St. Marys.

Section I also discusses algal toxin monitoring results in recreational waters, drinking water, and fish tissue. Monitoring for 2012 detected high levels of various algal toxins in Grand Lake St. Marys and Buckeye Lake above 2011 levels. Dillon Lake State Park showed a different bloom with a different toxin in 2012 than in previous years (a bright red bloom caused by Euglena sanguinea). There was an increase in algal toxin monitoring in raw and treated drinking water between 2010 and 2012. Ohio collected 487 raw water samples, and 455 samples were voluntarily submitted by public water systems, which included locations at inland lakes and Lake Erie. The majority of drinking water sources contained cyanotoxins at levels above the reporting limit. Sampling showed that cyanotoxins continued to increase at the City of Celina's intake on Grand Lake St. Marys (in raw, unfinished water). HABs were present at water supplies in every Ohio EPA district and in the western and central Lake Erie basins (2014 IR Section I 4.3.2).

Methodologies for analyzing cyanobacterial algal toxins in fish tissue are being developed to determine acceptable human consumption rates and human health hazards. Ohio EPA is continuing further analysis for sampling of the algal toxin microcystin in fish fillets via a grant from the Ohio Water Development Authority, contracted to The State University of New York. Prior to 2010, it did not appear that microcystin was accumulating in fish tissue, but in 2011 it was detected in sufficient concentrations to result in an advisory for black crappie in 2011, and there was detection in one common carp.

Ohio has increased its Lake Erie water quality sampling since the last listing cycle through the National Coastal Condition Assessment (NCCA) in 2010. This assessment used a statistical survey designed to report on the condition of marine and Great Lakes coasts, and Ohio worked through EPA's Great Lakes National Program Office (GLNPO) to gain experience with sampling methods. Sampling was completed at previously established monitoring stations that had not been visited since the 1990's. Additional sampling was completed with GLRI funding including the assessment of zooplankton and phytoplankton in open waters, and fish, macroinvertebrates, and periphyton in the shoreline, bays, harbors and estuaries.

Section J of the 2014 IR: Addressing Waters not Meeting Water Quality Goals – Section J reviews and summarizes the listing framework, explains the prioritization and delisting process and results, and reports on Ohio's TMDL program and schedule for TMDL development and monitoring. Table J-1 below shows the attainment and listing categories Ohio uses, with the shaded categories indicating those defined by EPA. New categories in this listing cycle are 1d, which is for locations where a TMDL is complete but new data show the AU is meeting water quality standards, and 5d for locations where a TMDL is complete but new data show the AU is not meeting water quality standards due to new contaminants.

Table J-1 below from the 2014 IR includes the attainment, impairment, or unknown status in each designated use category. Also new for this listing cycle is subcategory "t", which includes waters for which a TMDL has been completed at a different Hydrologic Unit scale, that is, approved at the HUC-11 scale then reassessed within the new HUC-12 scale. Table J-4 below from the 2014 IR includes a summary of waters impaired or attaining standards for each beneficial use for each type of AU.

Table J-1. Category definitions for the 2014 Integrated Report and 303(d) list.

Category[1]		Subcategory	
0	No waters currently utilized for water supply		
1	Use attaining	d	TMDL complete; new data show the AU is attaining water quality standards
		h	Historical data
		t	TMDL complete at 11-digit hydrologic unit scale; AU is attaining water quality standards at 12-digit hydrologic unit scale
		x	Retained from 2008 IR
2	Not applicable in Ohio system		
3	Use attainment unknown	h	Historical data
		i	Insufficient data
		t	TMDL complete at 11-digit hydrologic unit scale; there may be no or not enough data to assess this assessment unit at the 12-digit hydrologic unit scale
		x	Retained from 2008 IR
4	Impaired; TMDL not needed	A	TMDL complete
		B	Other required control measures will result in attainment of use
		C	Not a pollutant
		h	Historical data
		n	Natural causes and sources
		x	Retained from 2008 IR
5	Impaired; TMDL needed	M	Mercury
		d	TMDL complete; new data show the AU is not attaining water quality standards
		h	Historical data
		x	Retained from 2008 IR

[1] Shading indicates categories defined by U.S. EPA; additional categories and subcategories are defined by Ohio EPA.

Table J-4. Summary of results for each beneficial use[1].

	Human Health (Fish Contaminants)	Recreation	Aquatic Life	Public Drinking Water
Watershed assessment units				
Not being used for public water supply	0	0	0	1427
Attains	191	141	341	33
Unknown	926	511	220	67
Impaired, needs TMDL	421	461	479	10
Impaired, TMDL complete	0	425	420	1
Impaired, other remedy	0	0	0	0
Impaired, not pollutant	0	0	11	0
Impaired, natural condition	0	0	67	0
Total watershed units evaluated	1538	1538	1538	1538
Large river assessment units				
Not being used for public water supply	0	0	0	29
Attains	1	3	18	1
Unknown	2	10	0	4
Impaired, needs TMDL	35	21	14	4
Impaired, TMDL complete	0	4	3	0
Impaired, other remedy	0	0	0	0
Impaired, not pollutant	0	0	3	0
Total large river units evaluated	38	38	38	38
Lake Erie assessment units				
Attains	0	1	0	2
Unknown	0	0	0	0
Impaired, needs TMDL	3	2	3	1
Total Lake Erie units evaluated	3	3	3	3

[1] Reported using federally-defined categories (see Table J-1), except for two defined by Ohio (category 0 (not being used for public water supply) and subcategory 4n (impaired due to natural condition)). Other Ohio-defined subcategories are included in federal categories.

Section M of the 2014 IR: An Overview of Ground Water Quality in Ohio – Section M reviews programs that monitor, evaluate, and protect ground water. Table M-2 below from the 2014 IR includes data from entities and programs that report and summarize ground water contamination by facility. These include the federal National Priorities List (NPL), CERCLIS (Comprehensive Environmental Response, Compensation, and Liability Information System), the Department of Defense/Department of Energy (DOD/DOE), Leaking Underground Storage Tanks (LUST), RCRA Corrective Actions, and Underground Injection. Analyses include inorganic and organic pesticides, halogenated solvents, petroleum compounds, nitrate, fluoride, salinity, metals, radionuclides, bacteria, protozoa, viruses, and VOCs. Sources of contaminants (as shown in Map M-4 in the 2014 IR) are varied and include fertilizer applications, manure applications, storage tanks, landfills, septic systems, shallow injection wells, hazardous waste sites, pipelines and sewer lines, salt storage and road salting, small scale shops, and urban runoff (stormwater management).

Table M-2. Ground water contamination summary.
Hydrogeologic Setting: Statewide
Data Reporting Period: As of September, 2013

Source Type	Number of sites	Number of sites that are listed and/or have confirmed releases	Number of sites with confirmed ground water contamination	Contaminants
NPL - U.S. EPA	37	37	34	Mostly VOCs and heavy metals; also, SVOCs, PCBs, PAHs and others
CERCLIS (non-NPL) - U.S. EPA	438	438	20	Varied
DOD/DOE	128[a]	71	68	Varied
LUST	33,858[b]	3,355	233[c]	BTEX
RCRA Corrective Action	130	130	130	VOCs, heavy metals, PCBs, and others
Underground Injection	Class[d]: I - 10 II - 362 III - 46 IV - 0 V - 50,000+	 0 0 0 0 NA	 0 0 0 0 NA	
State Sites[e]	636	636	253[f]	Varied
Nonpoint Sources	NA	NA	NA	

Notes: NA - Numbers not available
[a] Includes DOE, DOD, FUSRAP and FUD sites
[b] Includes only active LUST sites - Source: Ohio's State Fire Marshal, Bureau of Underground Storage Tank Regulations
[c] Sites in Tier 2 or Tier 3 cleanup stages. Source: Ohio's State Fire Marshal, Bureau of Underground Storage Tank Regulations
[d] Class II and Class III injection wells regulated by the Ohio Department of Natural Resources, Division of Oil and Gas Resources. Class IV injection wells are illegal in Ohio. The total number of Class V injection wells in Ohio is unknown.
[e] Facilities in Ohio EPA's Ground Water Impacts database
[f] A site is considered to be contaminating ground water if the "Uppermost Aquifer" or "Lower Aquifer" is noted to be impacted, found in Ohio EPA's Ground Water Impacts database

A Maximum Contamination Limit (MCL) exceedance is used as the criterion for determining impairment of public water systems (PWS) or wells. A location is included on the "watch list" if the measured value is 50% to 100 % of the MCL. Ohio includes impaired and watch list distribution maps for arsenic, sulfate, fluoride, and nitrate. Table M-4A is a comprehensive count of PWSs where 2003-2013 decadal mean values of compliance data occur in the Watch List and Impaired Waters category and is incorporated by reference. Presentation is by chemical, standard type, standard, major aquifer (rock type), total PWS for raw and treated water on the Watch List or Impaired Waters List.

Ohio River Listing

The AUs associated with the main stem of the Ohio River are assessed by the Ohio River Valley Sanitation Commission (ORSANCO), which reports its findings in a Section 305(b) report. ORSANCO is an interstate agency charged with abating pollution in the Ohio River Basin and preventing future degradation of its waters. ORSANCO was established in 1948 through the

signing of the Ohio River Valley Water Sanitation Compact by representatives of the eight member states. Through this Compact, ORSANCO has been given authority to develop the Section 305(b) report for the Ohio River. Ohio participates in the ORSANCO workgroup to promote consistency between 305(b) reporting and 303(d) listing. In the past, Ohio EPA has incorporated ORSANCO's 305(b) assessment into its Integrated Report for those portions of the Ohio River located within the State of Ohio. Section D4 of the 2014 Integrated Report states that that Ohio EPA defers to the impaired segment assessment found in the *2012 Biennial Assessment of Ohio River Water Quality Conditions* (ORSANCO 2012). These waters are incorporated into Ohio's 303(d) list by reference. Section J2 of the 2014 IR states that ORSANCO has lead responsibility for doing the technical work in developing TMDLs for the Ohio River. However, ORSANCO is not required under 303(d) to submit the TMDLs to EPA for approval. Although ORSANCO is working on the development of bacteria TMDLs for the mainstem of the Ohio River in cooperation with its member states and the EPA, its authority is limited to assessments under 305(b).

EPA's monitoring and assessment program is coordinating with ORSANCO to review monitoring strategies for the next funding cycle.

Water Quality Standards

Ohio water quality standards consist of designated uses, and numeric and narrative criteria designed to protect and measure attainment of the uses (OAC 3745-1-07(A)). A water body may have more than one use designation. Each water body in the State is assigned an aquatic life habitat use designation, and may also be assigned a water supply use designation and/or one recreational use designation (OAC 3745-1-07(A)(1)). Ohio has multiple sub-categories or tiers in its aquatic life use designation system (coldwater, seasonal salmonid, exceptional warmwater, warmwater, and modified warmwater habitats, and limited resource waters) (OAC 3745-1-07(B)(1)). Ohio water quality standards include three categories for both the recreational (bathing waters, primary contact and secondary contact recreation) and water supply (public, agricultural, and industrial) use designations. The Ohio Administrative Code contains statewide chemical-specific criteria for the support of use designations (OAC 3745-1-07(A)(2)). The following Table D-1 is taken from Section D2 of the 2014 Integrated Report, and shows the designated uses, beneficial use categories, attributes of each category, and evaluation status for the 2014 IR (the date in the title of Table D-1 is in error, it has been updated for 2014).

Table D-1. Ohio water quality standards in the 2012 Integrated Report.

Beneficial Use Category	Key Attributes [why a water would be designated in the category]	Evaluation status in 2014 Integrated Report
Categories for the protection of aquatic life		
Coldwater Habitat	native cold water or cool water species; put-and-take trout stocking	Assessed on case by case basis
Seasonal Salmonid Habitat	supports lake run steelhead trout fisheries	No direct assessment, streams assessed as EWH or WWH
Exceptional Warmwater Habitat	unique and diverse assemblage of fish and invertebrates	61% of the WAUs and 92% of the LRAUs fully assessed using direct comparisons of fish and macroinvertebrate community index scores to the biocriteria in Ohio's WQS; sources and causes of impairment were assessed using biological indicators and water chemistry data
Warmwater Habitat (WWH)	typical assemblages of fish and invertebrates	
Modified Warmwater Habitat	tolerant assemblages of fish and macro-invertebrates; irretrievable condition precludes WWH	
Limited Resource Waters	fish and macroinvertebrates severely limited by physical habitat or other irretrievable condition	Assessed on case by case basis
Categories for the protection of recreational activities		
Bathing Waters	Lake Erie (entire lake); for inland waters, bathing beach with lifeguard or bathhouse facility	Lake Erie public beaches fully evaluated; nine inland lakes evaluated
Primary Contact Recreation	waters suitable for one or more full-body contact recreation activity such as wading and swimming; three classes are recognized, distinguished by relative potential frequency of use	43% of the WAUs, 42% of the LRAUs, and 100% of beaches in LEAUs assessed using applicable PCR geometric mean *E. coli* criteria
Secondary Contact Recreation	waters rarely used for recreation because of limited access; typically located in remote areas and of very shallow depth	Assessed as part AU using applicable SCR geometric mean *E. coli* criteria
Categories for the protection of water supplies		
Public Water Supply	waters within 500 yards of all public water supply surface water intakes, publically owned lakes, waters used as emergency supplies	Sufficient data were available to assess 37% of the 129 AUs with PDWS use; assessed using chemical water quality data; only waters with active intakes were assessed
Agricultural Water Supply	water used, or potentially used, for livestock watering and/or irrigation	Not assessed
Industrial Water Supply	water used for industrial purposes	Not assessed

<u>Human Health</u>: Ohio explains the linkage of water chemistry, fish tissue contaminants, and fish consumption advisories (FCAs) in Section E2 of the 2014 IR for human health standards development. WQS are based on the concentration of chemicals in water, but because the chemicals are known to bioaccumulate in fish, chemical measurements in fish tissue are taken into account for WQS development and for listing. A FCA provides the amount of fish from those waters that may safely be consumed and still protect human health.

There are criteria for six contaminants, mercury, PCBs, chlordane, DDT, mirex, and hexachlorobenzene for assessing attainment of the human health designated use related to fish consumption, with data used from both fish tissue and the water. These contaminants may bioaccumulate in fish and fish tissue data are used to determine whether a FCA is warranted for the protection of human health. Decisions on whether to list these waters are dependent on individual conditions (See Table E-1 below). The FCA may be considered by the state when

making a listing decision, but listing is not based solely on that waterbody having a FCA. For example, if a fish consumption advisory is less protective than the WQS, the waterbody will be listed as impaired; if the advisory is more protective and the WQS is not exceeded, the water may not be listed even if it has a FCA (See Figure E-1 below).

Table E-1. Comparison between fish concentration values and FCA program values.

Basin / Parameter	Fish concentration on which the WQS is based [1]	Range of fish concentrations triggering an "eat no more than one meal per week" advisory	Range of fish concentrations triggering an "eat no more than one meal per month" advisory
Lake Erie / PCB	23 µg/kg	50 - 220 µg/kg	221 - 1,000 µg/kg
Ohio River / PCB	54 µg/kg	50 - 220 µg/kg	221 - 1,000 µg/kg
Lake Erie / mercury	350 µg/kg	110 - 220 µg/kg	221 - 1,000 µg/kg
Ohio River / mercury	1,000 µg/kg	110 - 220 µg/kg	221 - 1,000 µg/kg
Lake Erie / DDT	140 µg/kg	500 - 2,188 µg/kg	2,189 – 9,459 µg/kg
Ohio River / DDT	320 µg/kg	500 - 2,188 µg/kg	2,189 – 9,459 µg/kg
Lake Erie / Chlordane	130 µg/kg	500 - 2,188 µg/kg	2,189 – 9,459 µg/kg
Ohio River / Chlordane	310 µg/kg	500 - 2,188 µg/kg	2,189 – 9,459 µg/kg
Lake Erie / Hexachlorobenzene	29 µg/kg	800 - 3,499 µg/kg	3,500 - 15,099 µg/kg
Ohio River / hexachlorobenzene	67 µg/kg	800 - 3,499 µg/kg	3,500 - 15,099 µg/kg
Lake Erie/ mirex	88 µg/kg	200 - 874 µg/kg	875 - 3,783 µg/kg
Ohio River/ mirex	200 µg/kg	200 - 874 µg/kg	875 - 3,783 µg/kg

Values	Advisory is less protective than the WQS criterion, WQS exceeded, waterbody impaired
Values	Advisory is more protective than WQS criterion, WQS not exceeded, no impairment from FCA
Values	Advisory may be more, or less, protective than WQS criterion

[1] See Section E4 for an explanation of how these concentrations were calculated.

Figure E-1. Illustration of the relationship among the WQS values, the values that trigger issuance of FCAs and the resulting decision regarding waterbody impairment associated with an FCA.

Recreation: Ohio water quality standards state that Ohio may also designate a water body for recreational use (OAC 3745-1-07(A)(1)). Under the Ohio Administrative Code, recreational designations are in effect from May 1st to October 31st (OAC 3745-1-07(B)(4)). Table F-1 below, describes the methodology using the geometric mean. For bathing waters, the geometric mean *E. coli* shall not exceed 126 cfu per 100 ml in the recreational season and shall not exceed

235 cfu per 100 ml in a single sample. *E. coli* for primary and secondary contact recreation waters may not exceed the geometric mean values for these waters. Water quality standards for primary and secondary contact recreation waters do not include a single sample maximum criterion.

Table F-1. Summary of the recreation use assessment methods.

Bathing Waters		
Indicator	Criterion (Table 7-13, OAC 3745-1-07)	Assessment Method Summary
E. coli	Seasonal geometric mean *E. coli* content* based on samples from the recreation season within a calendar year is 126 cfu/100 ml; single sample maximum is 235 cfu/100 ml.	Applied to the three Lake Erie assessment units, exceedance of the geometric mean bathing water criterion or an exceedance of the single sample maximum for more than 10% of the recreation season is considered an impairment of the bathing water use.
Primary Contact and Secondary Contact		
Indicator	Criterion (Table 7-13, OAC 3745-1-07)	Assessment Method Summary
E. coli	Seasonal geometric mean *E. coli* content* based on samples from the recreation season within a calendar year is: Primary Contact Waters Class A: 126 cfu/100 ml Class B: 161 cfu/100 ml Class C: 206 cfu/100 ml Secondary Contact Waters 1030 cfu/100 ml	Applied to streams and inland lakes. Data from a recreation season are assessed on a site-by-site basis and compared to the applicable geometric mean *E. coli* criterion whenever more than one sample result is available for a WAU. Assessment units are considered to be in full attainment if all sites assessed within the AU meet the applicable geometric mean criterion and in non-attainment if one or more sites assessed within the AU exceed the applicable geometric mean criterion.

* *E. coli* concentrations are expressed in colony forming units (cfu) per 100 milliliters (ml)

Aquatic Life Use: Ohio's standards contain numeric biological criteria that describe the expected biological performance of Ohio's wadeable and boatable rivers and streams. These biocriteria are codified in Ohio's water quality standards (OAC 3745-1-07, Table 7-15). Ohio EPA uses the numeric biological criteria to interpret the data generated when a biological assessment of a stream is conducted (OAC 3745-1-07(A)(6)). Through a use attainability analysis, a given stream reach may be assigned an appropriate aquatic life use. Biological sampling is conducted to establish attainment status, with further sub-classification based on ecoregion and size of waterbody. Ohio uses evidence from physical habitat surveys that include the characteristics of the stream that are critical to supporting aquatic life: 1) substrate, 2) in-stream cover, 3) channel morphology, 4) riparian zone and bank erosion, 5) pool/glide and riffle/run quality, and 6) gradient. Observed scores are compared with the target scores and a percentage deviation from the target is calculated.

Although chemical and physical data are collected as part of Ohio EPA's comprehensive watershed evaluations, the performance of the fish and macroinvertebrate communities is used to determine attainment status. Section G discusses the biosurveys that measure performance. For a sampling site to be classified as being in full attainment it must meet the relevant criteria in

three indices: Index of Biotic Integrity (IBI) (fish); the Modified Index of Well-being (MIWb) (fish); and, the Invertebrate Community Index (ICI) (OEPA 1999). The chemical and physical scores are used to confirm the biological impairment or attainment determination.

Public Drinking Water Supply: Ohio's water quality standards state that Ohio may also designate a water body for water supply use (OAC 3745-1-07(A)(1)). Ohio has three water supply uses: public, agricultural, and industrial. A public water supply is a water that with conventional treatment will be suitable for human intake and meet federal regulations for drinking water (OAC 3745-1-07(B)(3)(a)). PDWS are designated waters within 500 yards of an active intake or waters of a publicly owned lake. Ohio EPA collected and reviewed data from public water systems for treatment methods, locations of intakes, number of reservoirs, and water quality. Ohio EPA also collected data in 2009 to better evaluate the algal toxin threat to drinking water by obtaining information on treatment processes, algae control measures, and source water treatment costs. Sampled water quality data (using average annual values for all contaminants except for nitrates) were compared to the numeric chemical water quality criteria for the protection of human health (OAC 3745-1-33 and 34).

Section H in the 2014 Integrated Report summarizes the PDWS assessment. Evaluation methodology includes measurement of both treated waters and source waters, using nitrate, pesticides, cyanotoxins, and *Cryptosporidium* as indicators of water quality, using criteria and conditions as described in Table H-1 below. The waters are determined to be in full support, impaired, not assessed, or put on a "watch list", i.e., targeted for additional monitoring and assessment, applicable to any of the contaminants.

Table H-1. Public drinking water supply attainment determination.
Applies to ambient and treated water quality data from 2008 through December 2012.

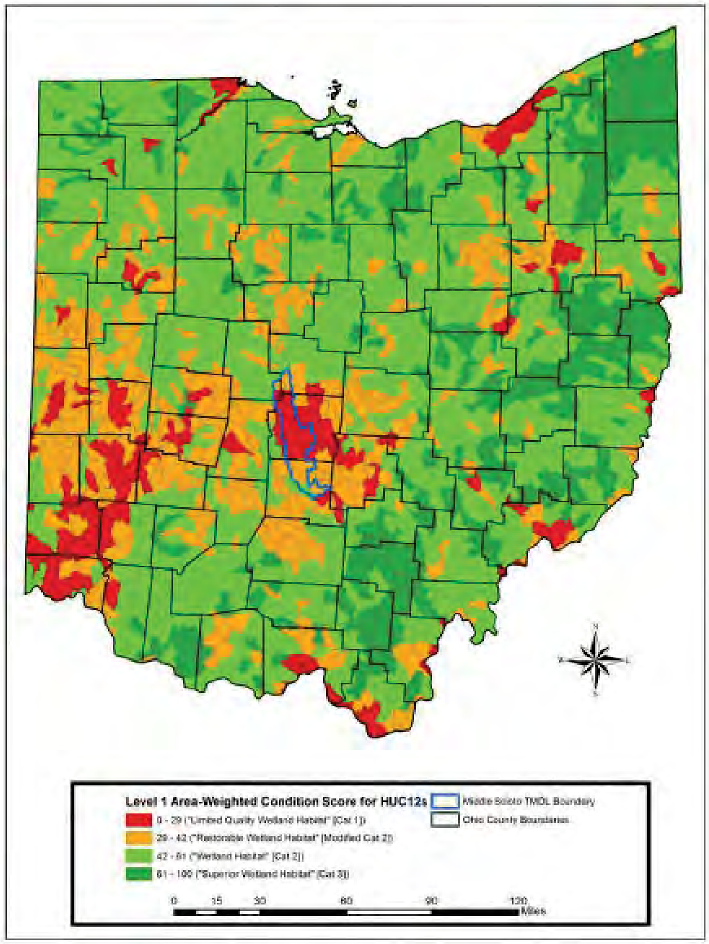
Indicator	Impaired Conditions
Nitrate	☐ Two or more excursions[1] above 10.0 mg/L within the 5 year period
Pesticides	☐ Annual average exceeds WQ criteria (atrazine = 3.0 µg/L)
Other Contaminants	☐ Annual average exceeds WQ criteria
Algae: Cyanotoxins[2]	☐ Two or more excursions[1] above the state drinking water thresholds (microcystins = 1.0 µg/L) within the 5 year period
Cryptosporidium[3]	☐ Annual average exceeds WQ criterion (1.0 oocysts/L)
Indicator	**Full Attainment Conditions**
Nitrate	☐ No more than one excursion[1] above 10.0 mg/L within the 5 year period
Pesticides	☐ Annual average does not exceed the WQ criteria (atrazine = 3.0 µg/L)
Other Contaminants	☐ Annual average does not exceed the WQ criteria
Algae: Cyanotoxins	☐ No more than one excursion[1] above the state drinking water thresholds (microcystins = 1.0 µg/L) within the 5 year period
Cryptosporidium	☐ Annual average does not exceed the WQ criterion
Indicator	**"Watch List" Conditions** *Source waters targeted for additional monitoring and assessment*
Nitrate	☐ Maximum instantaneous value > 8 mg/L (80% of WQ criterion)
Pesticides	☐ Running quarterly average ≥ WQ criteria ☐ Maximum instantaneous value ≥ 4x WQ criteria
Other Contaminants	☐ Maximum instantaneous value ≥ WQ criteria
Algae: Cyanotoxins	☐ Maximum instantaneous value ≥ 50% of the state drinking water thresholds
Cryptosporidium	☐ Annual average ≥ 0.075 oocysts/L

[1] Excursions must be at least 30 days apart in order to capture separate or extended source water quality events.
[2] Impaired conditions based on source water detections at inland public water systems and detections at public water system intakes for Lake Erie source waters. Cyanotoxins include: microcystins, saxitoxin, anatoxin-a, and cylindrospermopsin.
[3] Impaired conditions for *Cryptosporidium* are based on water quality criteria that Ohio EPA intends to develop.

The water quality criteria are:
1) Nitrate 10 mg/L, directly corresponding to the Safe Drinking Water Act Maximum Contaminant Level (MCL);
2) Atrazine 3.0 µg/l;
3) *Cryptosporidium* water quality criteria are being developed, but if the annual average exceeds 1.0 oocysts/L the water is considered impaired. This value will likely be adopted as a water quality criterion before the next listing cycle; and
4) Algae: Cyanotoxins – two or more excursions above 1.0 µg/L of microcystin within the 5 year period.

As discussed above, this is the first listing cycle that includes assessments based on microcystin, which is the focus of Ohio's assessment out of four possible cyanotoxins; this is also the first listing cycle that showed exceedences of microcystin in drinking water intakes, leading to impairment listing of the WLEB shoreline for the PDWS use.

Figure 10. All HUC 12 watersheds in Ohio symbolized by area-weighted Level 1 wetland condition score for all NWI wetlands occurring within each watershed.



Inland lakes and reservoirs: All lakes in Ohio are currently designated as Exceptional Warmwater Habitat (EWH) for ALU; the designation is in the process of changing to Lake Habitat (LH). The revised designation will retain the current criteria and include nutrient water quality criteria. No biocriteria currently apply to lakes, only to rivers and streams. Numeric criteria that will protect aquatic life will apply to the lakes in future assessments. Assessment of Lake Habitat ALU will rely solely on water quality sampling (not biological monitoring). Future lake assessments will likely include Harmful Algal Blooms (HAB) and cyanotoxins. Ammonia, Chlorophyll a, dissolved oxygen, nitrogen, pH, phosphorus, Secchi disk and temperature are being proposed as parameters for LH criteria and are listed in Table I 3-1 below. Results of sampling at fourteen lakes are provided in Table I 3-2 of the 2014 IR. Results show eight lakes

with chlorophyll-a exceedences and five on the watch list. Twelve Lakes are included on the watch list for phosphorus, nitrates, and/or Secchi depth, and seven had exceedences of DO, pH and/or NH3. One lake had a copper exceedance.

Table I3-1. Proposed[1] lake habitat use criteria.
Note: All criteria are outside mixing zone averages unless specified differently.

Parameter Lake type	Form[2]	Units[3]	Statewide criteria	Ecoregional Criteria[4] ECBP	EOLP	HELP	IP	WAP
Ammonia	T	mg/l	Table 43-4	--	--	--	--	--
Chlorophyll a[5]								
Dugout lakes	T	µg/l	6.0	--	--	--	--	--
Impoundments	T	µg/l	--	14.0	14.0	14.0	14.0	6.2
Natural lakes	T	µg/l	14.0	--	--	--	--	--
Upground reservoirs	T	µg/l	6.0	--	--	--	--	--
Dissolved oxygen[6] All lake types	T	mg/l	5.0 OMZM 6.0 OMZA	--	--	--	--	--
Nitrogen[5]								
Dugout lakes	T	µg/l	450	--	--	--	--	--
Impoundments	T	µg/l	--	930	740	930	688	350
Natural lakes	T	µg/l	638	--	--	--	--	--
Upground reservoirs	T	µg/l	1,225	--	--	--	--	--
pH All lake types	--	s.u.	A	--	--	--	--	--
Phosphorus[5]								
Dugout lakes	T	µg/l	18	--	--	--	--	--
Impoundments	T	µg/l	--	34	34	34	34	14
Natural lakes	T	µg/l	34	--	--	--	--	--
Upground reservoirs	T	µg/l	18	--	--	--	--	--
Secchi disk transparency[7]								
Dugout lakes	--	m	2.60	--	--	--	--	--
Impoundments	--	m	--	1.19	1.19	1.19	1.19	2.16
Natural lakes	--	m	1.19	--	--	--	--	--
Upground reservoirs	--	m	2.60	--	--	--	--	--
Temperature All lake types	--	--	B	--	--	--	--	--

1 Proposed in draft water quality standards rules, August 2008.
2 T = total.
3 m = meters; mg/l = milligrams per liter (parts per million); µg/l = micrograms per liter (parts per billion); s.u. = standard units.
4 ECBP stands for Eastern Corn Belt Plains; EOLP stands for Erie/Ontario Lake Plain; HELP stands for Huron/Erie Lake Plains; IP stands for Interior Plateau; and WAP stands for Western Allegheny Plateau.
5 These criteria apply as lake medians from May through October in the epilimnion of stratified lakes and throughout the water column in unstratified lakes.
6 For dissolved oxygen, OMZM means outside mixing zone minimum and OMZA means outside mixing zone minimum twenty-four-hour average. The dissolved oxygen criteria apply in the epilimnion of stratified lakes and throughout the water column in unstratified lakes.
7 These criteria apply as minimum values from May through October.
A pH is to be 6.5-9.0, with no change within that range attributable to human-induced conditions.
B At no time shall the water temperature exceed the average or maximum temperature that would occur if there were no temperature change attributable to human activities.

Removal of Waters from the 303(d) List

Section J of the 2014 IR describes the delisting of waters from the 2012 303(d) list. Ohio must demonstrate good cause for removal of waters from the list. Table J-5 below shows both delisting and listing of new waters. There are 282 delistings and 177 new listings, primarily in watershed assessment units. EPA concurs with the reasons for the changes because Ohio has demonstrated good cause, as discussed in the following sections.

Table J-5. Number of assessment units removed from or added to the 303(d) list.

	Number of Assessment Units			
	Watershed	Large River	Lake Erie	*Total*
Delistings (Remove from 303(d) list)				
Human Health (fish tissue)	90	0	0	***90***
Recreation	106	0	0	***106***
Aquatic Life	82	4	0	***86***
Public Drinking Water Supply	0	0	0	***0***
Total	***278***	***4***	***0***	***282***
New Listings (Add to 303(d) list)				
Human Health (fish tissue)	3	0	0	***3***
Recreation	136	6	0	***142***
Aquatic Life	24	0	0	***24***
Public Drinking Water Supply	6	1	1	***8***
Total	***169***	***7***	***1***	***177***

-Waters Meeting Water Quality Standards

The State's decision not to include certain AUs on its 2014 Section 303(d) list, also shown in Section J and Table J-6 below, is consistent with EPA regulations at 40 CFR 130.7(b)(6)(iv). Under 40 CFR 130.7(b)(6)(iv), States must demonstrate good cause for delisting. These causes were individually identified on the State's 2014 Section 303(d) list, due to: 1) methodology change using different AU size; 2) change in algal assessment methodology; 3) a flaw in original listing; 4) new data (meeting water quality standards); or 5) TMDL approval, as shown in Tables J-7, J-8, J-9 and J-10, respectively. The tables are incorporated into this document by reference.

Table J-6. Summary of reasons for changes to the 2014 303(d) list.

	Number of Assessment Units	
Reason for Change	**Removals**	**Additions**
Change in methodology (2010 AU size)	4	0
Change in methodology (algae)	0	7
Flaw in original listing	84	0
New data	62	170
TMDL approved	132	--
Total	***282***	***177***

-Waters Removed Based on TMDL Approval

The State's decision not to include certain AUs on its 2014 Section 303(d) list is consistent with EPA regulations at 40 CFR 130.7(b)(6)(iv). Under 40 CFR 130.7(b)(6)(iv), States are not required to list waters if all impairments are addressed in an approved TMDL. These waters were identified on the State's 2014 Section 303(d) list in Section J, Table J-10, with a change from Category 5 (the list) to Category 4A (approved TMDL). Table J-10 provides the designated uses, AU numbers and names of the waters. Table J-6 above summarizes the changes in listing status and total changes based on reasons for the changes.

Waters Subject to Other Pollution Control Requirements Stringent Enough to Implement any Water Quality Standards, 40 CFR 130.7(b)(1)(iii)

Under 40 CFR 130.7(b)(1), States are required to list WQLSs still requiring TMDLs where effluent limitations required by the CWA, more stringent effluent limitations required by State, local, or federal authority, or other pollution control requirements required by state, local, or federal authority, are not stringent enough to implement any applicable water quality standards. The regulation does not specify the time frame in which these various requirements must implement applicable water quality standards to support a State's decision not to list particular waters.

Monitoring should be scheduled for these waters to verify that the water quality standard is attained as expected in a reasonable time frame. Where standards will not be attained through implementation of the requirements listed in 40 CFR 130.7(b)(1) in a reasonable time, it is appropriate for the water to be listed on the Section 303(d) list to ensure that implementation of the required controls and progress towards compliance with applicable standards is tracked. If it is determined that the water is, in fact, meeting applicable standards when the next Section 303(d) list is developed, it would be appropriate for the State to remove the water from the list at that time.

Section L6 of the 2014 IR describes several projects addressing impairments and achieving water quality standards without a TMDL, classified as category 4B: "impaired, other required control measures will result in attainment of use." Ohio EPA indicates in Section L 6.2 of the IR that there are 4B demonstration locations within TMDLs, showing improvement toward full attainment status, that will be monitored for potential removal from the list in the next listing cycle (see table below).

Name of Watershed	Location of 4B in Report	Date of TMDL Approval	Locations of Updates in 2014 IR
Salt Creek Watershed (Scioto River basin)	Appendix D	8/12/2009	6.1.1.2
White Oak Creek Watershed	Appendix H	2/25/2010	6.2.1.2
Twin Creek Watershed	Appendix B	3/4/2010	6.2.2.2
Walnut Creek Watershed	Appendix B	5/4/2010	6.2.3.2
Great Miami River (upper) Watershed	Appendix E	3/26/2012	6.3.1.1

The State has demonstrated that there are other pollution control requirements required by State, local or federal authority that will result in attainment of water quality standards within a reasonable time.

Public Participation and Comments on Listing Decisions

The State's public participation process for the 2014 Integrated Report has been extensive. On May 23, 2013, Ohio EPA sent a mailing to all Level 3 qualified data collectors, including major NPDES discharge permit holders. A call for Level 3 Credible Data as posted on a web page is shown in Section D 5.1.1. Details of Level 3 Qualified Data Collector requirements are described in OAC Rule 3745-4-03(A)(4). Qualifications include a minimum of two years of practical experience in the following assessment categories: stream habitat assessment, fish community biology, benthic macroinvertebrate biology and/or chemical water quality assessment. (See Section D3, Table D-3, hereby incorporated by reference, listing the entities, data dates and data descriptions in the 2014 IR). On January 29, 2014, the State posted an announcement of its draft of the 2014 Integrated Report available on its public website (Section D 5.3 of the 2014 IR), including instructions for printed copy requests. The formal comment period for the 2014 Integrated Report was from January 29, 2014 to close of business on February 28, 2014. The Notice is included in the 2014 Integrated Report in Section D 5.3. Public comments received and Ohio EPA's responses are included in Section D 6; responses to EPA comments were addressed and incorporated into the 2014 Integrated Report.

During the public comment period the State received many comments that expressed concerns about several topics, including the four uses evaluated for listing, wetlands, harmful algal blooms, and proposed listing for Lake Erie. The State responded to all of the public comments and addressed its decision to not list certain waters on its 2014 Section 303(d) list. EPA has reviewed Ohio EPA's responses, and finds them to reasonably respond to the comments. As discussed in Sections D and H above, however, EPA is deferring its decisions regarding Ohio EPA's decision to not list the waters beyond the shoreline AU of the WLEB for PDWS impairment.

Priority Ranking and Targeting

EPA also reviewed the State's priority ranking of listed waters for TMDL development, and concludes that the State properly took into account the severity of pollution and the uses to be made of such waters, as well as other relevant factors such as status of recreation use, and the status of aquatic life. For near shore watershed areas of Lake Erie the waterbodies were assigned the same priority as the surrounding contiguous watersheds. Ohio defers to the EPA for prioritization of open waters of Lake Erie and to ORSANCO for the Ohio River. These waterbodies have low priority ranking for Ohio EPA initiated action, although many actions funded by EPA have been initiated and are underway in the Ohio River and in contributing watersheds to Lake Erie.

For the remaining waters in Category 5 of the Integrated Report, the State used a point system to determine the priority ranking of the AUs. Ohio EPA's point system is based on a maximum of 20 possible points (1 being the lowest priority and 20 being the highest priority, including categories of assigned points and extra points). The points were distributed as follows, and can be found in Section J 2 and Table J-3 of the 2014 Integrated Report, as shown below.

Table J-3. Priority points for impaired assessment units.

Points	Condition	# Assessment Units	
		WAUs	LRAUs
Human Health Use impairment (fish tissue contaminants) (maximum of 3 points)			
2	Listed as impaired for Fish Contaminants (Human Health Use)	421	35
+ 1	Additional point in assessment units that have greater than 500 parts per billion PCBs or mercury	3	5
Recreation Use impairment (maximum of 6 points)			
1	Listed as impaired, with assessment unit score[1] between 0 and 25	45	0
2	Listed as impaired, with assessment unit score[1] between 75.1 and 100	75	13
3	Listed as impaired, with assessment unit score[1] between 25.1 and 50	156	2
4	Listed as impaired, with assessment unit score[1] between 50.1 and 75	185	6
+ 2	Additional points if assessment unit contains Class A waters	53	21
Aquatic Life Use impairment (maximum of 4 points)			
1	Listed as impaired, with assessment unit score[1] between 0 and 25	218	1
2	Listed as impaired, with assessment unit score[1] between 75.1 and 100	17	10
3	Listed as impaired, with assessment unit score[1] between 25.1 and 50	128	1
4	Listed as impaired, with assessment unit score[1] between 50.1 and 75	126	2
Public Drinking Water Use impairment (maximum of 7 points)			
5	Listed as impaired for Public Drinking Water Use for one indicator	10	3
+ 2	Additional points in assessment units impaired for second indicator	2	3
1	Not listed as impaired, but on watch list; one point for each indicator	32	4

[1] The assessment unit score is reported on the summary sheets in Section L and on the assessment unit summaries on the web.

In addition, EPA reviewed the State's identification of WQLSs targeted for TMDL development in the next two years, and concludes that the targeted waters are appropriate for TMDL development in this time frame. Ohio considered various factors in developing both the long term and short term schedule.

Ohio builds on programmatic strengths in monitoring, modeling, permitting, and nonpoint source incentives to develop an integrated approach to TMDLs that aligns program goals and resources efficiently. Ohio also has an active stakeholder process for developing TMDLs. Ohio works on collecting data through the five-year rotating basin plans. Ohio's ALU data are valid for up to ten years for evaluating assessment units, so each AU must be monitored at least once every ten years. Each AU is assigned to one of the subsequent monitoring cycles using the following criteria: Ohio EPA's five-year Basin Monitoring Strategy; time since most recent assessment; distribution of work effort among Ohio EPA district offices; priority ranking; and TMDL schedule. Ohio has generated its long-term TMDL schedule based on local interest, funding and partnership potential. Some flexibility remains in long-term scheduling because it is difficult to predict these variables.

Table J-16 in Section J of the 2014 Integrated Report is the short-term schedule for TMDL Development and is hereby incorporated by reference.

Long term schedule

EPA has received Ohio's long-term schedule for TMDL development for all waters on the State's Category 5 list of impaired waters. EPA has requested that states provide such schedules.[4] Ohio has provided information for the long term schedule in Section J 5.2 of the 2014 IR. Ohio states that the five-year basin approach provides the foundation for most monitoring, and aquatic life use monitoring data up to ten years old are valid. However, due to decreased resources, cycling through the entire basin rotation would take about 15 to 20 years at current resource levels. Therefore, the AUs are assigned to one of the three cycles based on the five-year basin approach, the time since last assessment, workload distribution among OEPA district offices, priority ranking, and the TMDL schedule. EPA is not taking any action to approve or disapprove this schedule pursuant to Section 303(d).

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[4] See Memorandum from Robert Perciasepe, Assistant Administrator for Water, to Regional Administrators and Regional Water Division Directors, "New Policies for Developing and Implementing TMDLs", August 8, 1997.

References

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Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

January 11, 2016

Ms. Susan Hedman
Regional Administrator
U.S. EPA Region V
77 West Jackson Blvd.
Chicago, Illinois 60604

Dear Ms. Hedman:

The Ohio Supreme Court determined in March 2015 that Total Maximum Daily Loads (TMDLs), under Ohio law, constitute rulemaking and need to follow Ohio's administrative rule adoption process (Revised Code Chapter 119). The Court's decision means that all of Ohio EPA's past and future TMDLs will need to proceed through the 119 process in order to be lawfully established under Ohio law. This obviously has significant legal and programmatic implications, including an expectation that it will lengthen an already lengthy process to develop a TMDL and implement a remedy to improve water quality for an impaired waterbody.

We recently began a dialogue with members of the regulated community and are exploring alternatives that may result in a more streamlined approach. While we are only in the early stages of these discussions, the possible changes would likely require legislative action that will also be time consuming.

While we work on developing a state based consensus resolution, there are a number of TMDLs that have a direct impact on Lake Erie and our overall strategy for reducing harmful algae blooms and other nutrient impacts on rivers and streams. We believe completing these TMDL's is critical to making measurable reductions of nutrient loads in the Lake Erie basin. Therefore, I am asking for your assistance and formally requesting that USEPA federally establish the Sandusky Lower Tribs and Bay Tribs TMDL (originally approved August 11, 2014 and developed by a USEPA contractor) and the Maumee mainstem TMDL (currently under development by a USEPA contractor).

Please contact Cathy Alexander (614-644-2021) of the Division of Surface Water if you need additional information. I look forward to hearing of your decision at your earliest convenience.

Sincerely,

Craig W. Butler
Director

ec: Tinka Hyde, Director, Water Division, U.S. EPA Region 5
Tiffani Kavalec, Chief, Division of Surface Water

From: tahree lane
To: EPA dsw.webmail
Subject: 303(d) comments
Date: Monday, August 29, 2016 1:26:05 PM

Ohio EPA
Division of Surface Water, P.O. Box
1049, Columbus, Ohio 43216-1049
dsw.webmail@epa.ohio.gov

Attn: 303(d) Comments

Thank you for this opportunity to submit comments on Ohio's Clean Water Act Lake Erie water quality. Lake Erie is the drinking water source for 11 million people and is vital to Ohio's economy.
The following is requested:

1. That the western basin of Lake Erie be declared impaired and that the Toledo and Oregon intakes be part of the basin wide impairment rather that the proposed near shore area which is not a major contributor to the intake algae.

2. That Ohio EPA include wet weather in assessing nutrient runoff.

3. That Ohio EPA include algae/toxin's in its **recreational contact** impairments.

4. That Ohio EPA provides an **annual report** to the public that identifies **sources and amounts** of Lake Erie algae/nutrients and **how many pounds/units** are reduced from the funding/changes to reduce nutrient runoff.

5. **That Ohio EPA request the Ohio Department of Agriculture to create rules that LIMIT MANURE APPLICATION OF PHOSPHORUS TO THE CROP NEED/AGRONOMIC NEED/AMOUNT.**

6. That the report be MORE USER FRIENDLY. It is extremely difficult for the layperson to navigate and understand.

Sincerely,

Tahree Lane,
Toledo, Ohio

Lake Erie Improvement Association
3072 N.E. Catawba Rd.
Port Clinton, Ohio 43452
800-551-1592 *lakeerieimprovement.org*

Mission: LEIA is a Lake Erie watershed-wide economic sustainability initiative dedicated to healthy waters & fish by promoting cooperation & wise resource management for the benefit of the Lake Erie basin.

Lake Erie Waterkeeper Inc.
3900 N. Summit Bldg 2
Toledo, Ohio 43611

Lake Erie has the Great Lakes Warmest, Shallowest, Fishiest Waters
lakeeriewaterkeeper.org **800-551-1592**

Ohio EPA
Division of Surface Water, P.O. Box
1049, Columbus, Ohio 43216-1049
dsw.webmail@epa.ohio.gov

August 29, 2016

Attn: 303(d) Comments

The Lake Erie Improvement Association and Lake Erie Waterkeeper are pleased to submit the attached comments in response to the July 29, 2016 Notice of Availability and Request for Comments Federal Water Pollution Control Act Section 303(d) TMDL Priority List for 2016. The comments are on Ohio 2016 Integrated Water Quality Monitoring and Assessment Report Final Draft (Integrated Report). In 2014 Lake Erie Waterkeeper asked that Lake Erie be included in the report. Ohio EPA granted this request and in this 2016 there are sections that directly address Lake Erie. Thank you.

Lake Erie is an enormous resource for Ohio producing over 100,000 jobs and injecting over $14.2 billion to the economy. Lake Erie provides drinking water for 11 million people and is the 12th largest lake in the world. Lake Erie provides over half of the consumable fish in the Great Lakes. Lake Erie is the most vulnerable of the Great Lakes because of its shallow waters but is also the most resilient because its waters turn over every 2.6 years – and as little as 30-50 days in the western basin. Lake Erie has been a national and international example of the recovery of a lake once believed to be 'Dead". As we know in the last decade Lake Erie is once again experiencing large algal blooms with toxins causing economic losses and a ban on drinking water in Toledo for nearly one half million people.

Many say that it will take decades for the algae to be reduced but we know that if nutrient runoff that comes from heavy rains is reduced, Lake Erie will respond right away. We know this because of the drought in 2012 and similar conditions in 2016. If Ohio and other Lake Erie governments take action to reduce the nutrient sources, Lake Erie will be healthy. We know that taking phosphorus out of laundry detergent decades ago resulted in substantial decreases of phosphorus discharges from wastewater plants. Likewise we know that to help reduce Lake Erie nutrient sources – mainly dissolved phosphorus – requiring that manure be applied at agronomic/crop need rates would reduce dissolved phosphorus runoff to Lake Erie.

We also know that we can learn from others who have excess nutrients causing Harmful Algal Blooms – Chesapeake and the Fox River Green Bay. Both say that basin wide TMDL's are helping to achieve the needed reductions and that states are eligible for additional funding as a result of the basin wide TMDL's and Implementation Plans. A key component of the development of the TMDL is for stakeholder agreement on sources and amounts. Agreement on what is coming from where and how much is critical to knowing if progress is being made. Therefore we continue to ask that Ohio declare its portion of western Lake Erie Impaired followed by USEPA declaring the US waters of western Lake Erie Impaired. After this designation, we ask for an expedited basin wide TMDL with a request from Ontario to provide similar information.

Of great concern is Ohio's picking part of the western Lake Erie watershed – like the Maumee – instead of the western Lake Erie basin. This parceled out approach yields confusion and debate over the sources and amounts of nutrients causing the problem in Lake Erie.

Several other key recommendations contained in the attached comments are: Wet weather events must be included in the TMDL's; The Oregon and Toledo intakes should not be combined with the near shore(near shore is not where the 2014 algae came from for the Toledo crisis - the winds blew the algae from the open lake into the intake area and then the winds died to leave the algae cooking up toxins - therefore, the Toledo and Oregon intakes need to be in an Impaired western Lake Erie basin designation.

We have appreciated the opportunity to work with Ohio EPA on: Getting phosphorus reductions at the Detroit wastewater plant; Getting a fertilizer/manure ban on frozen ground; Getting funding for the Healthy Lake Erie Fund; Reducing the amount of dredge materials open lake disposed and other policies etc. that benefit Lake Erie.

We look forward to working for agreeing on sources and amounts and a reportable accountable plan that shows progress, or a lack thereof, in reducing the nutrients that cause the algae problems in Lake Erie. It is vitally important to achieve these reductions quickly to sustain and grow a Healthy Lake Erie economy.

Sincerely,

Sandy Bihn

Sandy Bihn
Vice President Lake Erie Improvement
Lake Erie Waterkeeper.

The following are the comments from the Lake Erie Improvement Association and Lake Erie Waterkeeper Inc. Comments are highlighted in gray and are made to various sections of the report relating to Lake Erie..

Section C Comments

Compliance and Enforcement Program

This section should include enforcement for NPDES permits issued through the Ohio Department of Agriculture for CAFO permit. It is understood that enforcement for these permits is by complaint. Also the permit information does not contain where the manure is being applied offsite of the NPDES permit.

Concentrated Animal Feeding Operations

Ohio EPA should be permitting and administering CAFO permits instead of the Ohio Department of Agriculture. ODA is committed to helping the agricultural industry. Water protection is the responsibility of Ohio EPA. Ohio allows manure application for phosphorus in soil to be 150ppm compared to the crop/ agronomic need of 40 ppm. Ohio NPDES permits should require that all manure that is applied has a phosphorus in soil limit of less than 40 ppm

Lake Erie Program

The Lake Erie Program should be informed by a basin wide Western Lake Erie Impaired designation followed by a TMDL and Implementations Plan.

Areas of Concern (Remedial Action Plans)

All of the Areas of Concern below should include assessment of upstream nutrients.

Ashtabula River AOC

Black River AOC

Cuyahoga River AOC

Maumee River AOC

Statewide AOC Projects

Lake Erie Lake-wide Action and Management Plan (LAMP, formerly LaMP)

Funding for the LAMPS has decreased and the LAMPS public involvement funding has ended. There is no coordination between the public and government in the development of these LAMPS and the tasks that they are to perform. The LAMPS are one more stand alone program that would benefit from a basin wide western Lake Erie basin Clean Water Act Impaired/TNMDL/Plan Process.

For both the AOCs and the LAMP, it is imperative to keep the local communities and stakeholders engaged. In Ohio's AOCs, the local communities and partners have played a significant role in obtaining the resources for implementation, providing matching funds and serving as the local sponsor. A reliable, long-term source of funding is essential to continue to

fund the administration and outreach costs associated with local coordinator leadership efforts. Public outreach efforts are also needed to better connect the decisions and projects in the watersheds to the environmental condition of the lake.

Agree that outreach for LAMPS is needed. This will take funding.

National Pollutant Discharge Elimination System (NPDES) Permits

The lawsuit on the wastewater TMDL's needs to be addressed quickly. Ohio EPA has long enough delayed action to resolve the problem.
Ohio EPA should administer CAFO permits.

Nonpoint Source (NPS) Program

Ohio's waters having a growing algae/toxin problem with the most prevalent source being nonpoint. Ohio's lakes, rivers and streams get greener and greener after wet weather – high flow events. Ohio nonpoint plans need to include assessment of Ohio's manure management practices as they relate to runoff and algae as well as commercial fertilizer and other agricultural practices. Ohio's assessment of dissolved phosphorus and Best Management Practices is needed. The information provided in this section is weak and needs reporting and accountability components

Progress toward achievement of Ohio's Section 319(h) grants program goals will continue to be measured as part of Ohio's NPS Monitoring and Assessment Initiative. For the past eight years, Ohio EPA staff has conducted all monitoring (physical, chemical and biological), beginning with baseline monitoring through project completion to determine the effectiveness of Section 319 (h) and SWIF funded NPS projects. This initiative not only provides cost savings and improved data quality, but also relieves grant recipients of a task which was often difficult for them to do properly. This initiative also serves as a very important environmental measure: are NPS-funded projects improving water quality or not?

Ohio's 319 program needs to be assessed and updated.

Section 208 Plans and State Water Quality Management Plan

There needs to be more public understanding and involvement in this program.

Total Maximum Daily Load (TMDL) Program

Ohio's TMDL's need to be consistent in their methodology and assessment . Ohio TMDL's where there is a nutrient impairment need to include wet weather as part of the TMDL.

As stated throughout these comments, Ohio needs to declare Ohio's waters in the western basin of Lake Erie Impaired and proceed expeditiously with a basin wide TMDL that is coordinated with Michigan and Indiana and to the extent possible Ontario.

Ohio needs to coordinate TMDL's in the Ohio River Watershed and the Lake Erie watershed. Ohio also needs have large river basin wide TMDL's and inland Lake watershed wide TMDL's.

Water Quality Standards (WQS) Program

Ohio's waters have increased algae problems in Lake Erie, the Ohio River, Ohio's inland lakes and rivers. Nutrient water quality standards are needed to help address these problems.

Ohio has failed to establish nutrient water quality standards as required in the Clean Water Act. USEPA has been negligent in enforcing this Clean Water Act requirement. Ohio EPA had a Phosphorus Task Force Committee to establish Water Quality Standard

recommendations several years ago. After many meetings over the years nothing has happened. Ohio uses the excuse that since there are no nutrient standards then the TMDL nutrient component is debatable at best.

Public participation is mandated and encouraged in all administrative rule makings including the WQS. Any interested individuals are afforded an opportunity to participate in the process of developing water quality standards. Ohio EPA reviews and, as appropriate, revises water quality standards at least once

every three years. When water quality standards revisions are proposed, the public is notified of these revisions. A public hearing is held to gather input and comments.

The public involvement process in Water Quality standards and TMDL's needs major improvements. When there are public meetings and notices, the information is very technical. Any suggestions by participants are met with regulatory speak. There is no understanding of what the standards/TMDL's mean and what will be done. It is just a pretty boring technical hard to understand information presentation.

C3. Program Summary – Drinking and Ground Waters

Drinking Water Program

Ohio has a good drinking water HAB notification program.

Source Water Protection Program

Several programs are in place or are being implemented to help protect Ohio's water resources. The Source Water Assessment and Protection Program protects aquifers and surface water bodies that are used by public water systems. A public water supply beneficial use assessment methodology has been developed in conjunction with DSW and it is being implemented.

Ohio's Source Water Protection Program for surface waters with toxic algae needs updating. While source water protection for spills etc. in surface waters is understood and with limited resources administered, source water protection for surface water with toxic algae has yet to be develop an assessment and source reduction program.

C5. Cooperation among State Agencies and Departments

Ohio Water Resources Council

The link below for this Council indicates that the State of Ohio proposes to eliminate this Council through proposed legislation in the May 2016 minutes. It seems contradictory to say that this council is to do coordination etc. when Ohio no longer supports the Council's work. The minutes indicate that the communication between the departments on water is needed and helpful. It would seem that expanding the council to include the public would be beneficial.

http://epa.ohio.gov/dsw/owrc.aspx.

Ohio Lake Erie Commission

The role of the Lake Erie Commission has changed in the last year. Those changes should be stated here along with the Lake Erie work that Ohio expects of the commission. The public's role and input should clearly be stated.

C6. Funding Sources for Pollution Controls

Clean Ohio Fund

Ohio has changed allocations and program eligibility for this program. This section needs to be updated.

Section 319 Grants Program

Historically, Ohio's 319 programs have not been administered to reduce nonpoint sources but rather as a watershed planning and management plan. Ohio's approved watershed plans are minimal as are endorsed watershed plans. Ohio's watershed planning needs to be revised to include wet weather events in TMDL's and most importantly a consistent Impaired/TMDL /Implementation process that connects watershed within Ohio's two overall watersheds – Lake Erie and the Ohio River.

Federal Farm Bill Funding in Ohio

There is growing concern that BMP's that get federal and state funding fail to accomplish nutrient reduction goals. The key considerations are dissolved phosphorus runoff and field tiles which often allow bypass of the runoff through the tile rather than 'through the BMP'.

Conservation Reserve Enhancement Program

Many farms have taken acreage out of CREP and now grow corn and beans in low lying and sloped areas which have reduced yields. This section should include the history of Ohio acres in CREP and the changes that have occurred.

Environmental Quality Incentives Program

There is growing concern that BMP's that get federal and state funding fail to accomplish nutrient reduction goals. The key considerations are dissolved phosphorus runoff and field tiles which often allow bypass of the runoff through the tile rather than 'through the BMP'.

In addition, manure management that receives EQIP Funding should be required to apply manure at the agronomic/crop need rate for phosphorus – not the nearly four times or more now being allowed.

Conservation Stewardship Program

The 4R NCRS Conservation program should include a requirement for manure to be applied at the agronomic/crop need rate. The program should also take into account dissolved phosphorus runoff through field tiles that bypass conservation practices at the surface.

C7. Harmful Algal Blooms Responses and Assessments

The harmful effects of these blooms are well documented in scientific literature and recognized by U.S.

Response to HABs

As incidents of HABs have increased, Ohio's response continues to evolve. The State has annually revised the State of Ohio's Harmful Algal Bloom Response Strategy for Recreational Waters (http://epa.ohio.gov/portals/35/hab/HABResponseStrategy.pdf) and the Public Water System Harmful Algal Bloom Response Strategy. Ohio EPA, ODH and ODNR have continued a close partnership to develop and implement the unified state response strategy. The ohioalgaeinfo.com web site provides background information about HABs; tips for staying safe when visiting public lakes; links to sampling information; and current advisories and contact information for reporting suspected HABs. It also includes historic and

current cyanotoxin data for public water supplies and a link to the ODH BeachGuard site, which has information about recreation advisories for both bacteria and algae (http://publicapps.odh.ohio.gov/BeachGuardPublic/Default.aspx).

These are excellent programs that keep the public informed and are reasonably easy to use.

HAB Recreational Advisories

This is an excellent program.

At the present time, Ohio EPA does not list lakes as impaired for recreational use when recreational advisories are posted at public beaches. Addressing water quality impairments in the lake's watershed should eventually reduce nutrient enrichment in lakes and thereby reduce cyanobacteria blooms.

Recreational contact is one of the four impairment categories. Ohio has established contact standards for recreational contact. Ohio monitors the beaches and places warning signs up when the algae/toxins exceed Ohio's standards. Saying that 'addressing water quality impairments in the Lake's watershed should reduce nutrients, is counter to the Clean Water Act fishable swimmable waters criteria. Ohio has recreational contact standards, monitors and closes beaches when the standards are exceeded. Given Ohio's impaired criteria, Ohio must declare the Lake Erie waters impaired for recreational contact and also the inland lakes. Ohio representatives have stated that once federal standards are established, then the waters will be declared impaired for recreational contact and will require a TMDL. Ohio is not preempted by USEPA from establishing recreational contact standards and the extensive use and beach postings using Ohio's standards, obligates Ohio to declare these waters impaired

Annual Prioritization of Impaired Waters for TMDL Development:

Ohio will continue to use the Priority Point System in Section J2 of the IR. Points are given for presence

Assessment Goal

Protection Goal

Ohio's TMDL's are inconsistent and difficult to understand and many are over ten years old and lack updates. The reality is that many of Ohio's waters are experiencing growing problems with harmful toxic algal blooms. Grand Lake St. Marys has had no recreational contact beach warnings for the past eight years. If Ohio's program for reducing toxic algae sources, then the beaches at Grand Lake St. Marys would be opened. Ohio's failure to reduce sources to allow the beaches at Grand Lake St. Mary's to be safe to swim in. Ohio's protection goals and antidegredation policies are not working.

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Section D

1. Aquatic Life: Analysis of the condition of aquatic life was the long-standing focus of reporting on water quality in Ohio and continues to provide a strong foundation. The 2016 methodology is unchanged from what was used in the 2014 IR. Additionally, as in the 2012 and 2014 IRs, a methodology for assessing the aquatic life condition of inland lakes is previewed for possible inclusion in the 2018 or 2020 report provided necessary rule revisions to the Ohio Water Quality Standards are promulgated.

2. Recreation: A methodology for using bacteria data to assess recreation suitability was developed for the 2002 report and refined in 2004, remaining essentially the same for 2006 and 2008. In 2010, the recreation use analysis changed significantly to a new indicator, a new water quality standard, and a data grouping procedure similar to that used for aquatic life. The methodology has not changed for the 2016 report.

   This section needs to include a new core indicator based on algae and associated cyanotoxins, and assessment units listed as impaired for algae

3. Human Health: A methodology for comparing fish tissue contaminant data to human health criteria via fish consumption advisories was included in the 2004 report. That methodology has been refined in each subsequent report to align more directly with the human health water quality criteria. The methodology was changed in the 2010 report to be consistent with the methodology described in U.S. EPA's 2009 guidance for implementing the methylmercury water quality criterion. The methodology has not changed for the 2016 report.

   A. As Bowling Green data show the intake water microcystin level at its water-plant reservoir reservoir is frequently at recreational cautionary levels. No advisory has been issued to swimmers, boaters, kayakers, or fisherman using the Maumee River, the origin of the intake water, as a recreational resource.

   B. Fish tissue should be measured for BMAA toxin in brain and neurologic tissue as BMAA has recently been found in the brain tissue in fish from Grand Lake St. Mary's. (Personal communication from Geo. Bullerjahn)

C.BMAA unlike microcystin, saxitoxin, et alia, are not being measured. Current literature suggests that this is likely a serious omission.

4. Public Drinking Water: The assessment methodology for the public drinking water supply (PDWS) beneficial use was first presented in the 2006 report. Updates to the methodology have been presented in subsequent reports. For the 2014 report, it was revised to include a new core indicator based on algae and associated cyanotoxins, and assessment units listed as impaired for algae. The methodology has not changed for the 2016 report.

D1. Assessment Units

1. Lake Erie Assessment Units (LEAUs) – for three shoreline areas of the lake: western (Ohio/Michigan state line to eastern terminus of Sandusky Bay opening to Lake Erie); central (eastern terminus of Sandusky Bay opening to Lake Erie to Ohio/Pennsylvania state line); and Lake Erie islands (including South Bass Island, Middle Bass Island, North Bass Island, Kelleys Island, West Sister Island and other small islands) extending 100 meters from the shore. These assessment units also include Public Drinking Water Supply intake zones (500-yard radius around intakes) associated with the nearest shoreline unit even if they are greater than 100 meters from the shore.

Ohio's designation of Lake Erie Assessment Units lacks rationale for the Ohio Lake Erie open waters. Ohio declares the western Lake Erie nearshore impaired. But this definition does not include the Toledo and Oregon intakes. In January 2016 USEPA and Ohio agreed to an impaired designation for the Toledo and Oregon intakes of 500' around the intake. Obviously, this impairment designation does not include the open water toxic algae sources that caused Toledo's drinking water crisis.
The second 'Assessment Unit' is the near shore in the central basin.
The third 'Assessment Unit' is the Lake Erie islands which are in the open waters of Lake Erie.
All three of these assessment units have algal toxin sources from the Maumee River and other tributaries. To get to the Lake Erie islands the algal toxins from the Maumee River and other tributaries have to pass mostly through Ohio open Lake Erie waters. Doing a TMDL for the three assessment units without including Ohio's open Lake Erie waters and tributary sources will not lead to delisting of the impairment because research and other information clearly show that the Maumee and other tributaries are the major source of the harmful toxic algae. Therefore Ohio has to declare the entire Ohio portion of the western basin of Lake Erie watershed as impaired to reduce algal toxins. This would be the Ohio Western Lake Erie Watershed Assessment Unit

D3. Evaluation of Lake Erie

Ohio's assessment and impairment designation for Lake Erie has been the focus of considerable discussion between Ohio EPA, U.S. EPA and local stakeholders. In Ohio's 2014 Integrated Water Quality Report *Section I: Considerations for Future Lists*, Ohio

proposed a new approach for Lake Erie with new

assessment units and methodology for the nearshore and open waters. Ohio EPA initially planned to adopt the new assessment units and methodology during a later IR cycle, anticipating that the GLWQA Annex 4 efforts would produce nutrient concentration targets or criteria for the open waters.

The GLWQA Annex 4 efforts so far have resulted in load reductions targets rather than in-lake nutrient concentration targets or criteria. For this and other reasons outlined in Section J3, Ohio does not intend to pursue development of the open water assessment units and methods at this time. Ohio EPA believes that assessment and listing of the open waters under the CWA should be led by U.S. EPA in consultation with the states and Ohio is willing to assist its federal partners with the development of appropriate monitoring and assessment protocols for the open waters. Federal leadership on the open water assessments will also facilitate coordination with the ongoing GLWQA Annex 4 efforts (U.S. EPA and Environmental Canada are federal co-leads). In the meantime, Ohio is actively working towards the nutrient reduction goals for Lake Erie recommended by the Annex 4 subcommittee (see Section J3 for more information).

To be clear, the three current Lake Erie shoreline units have been assessed and impairment determinations made for the aquatic life use, recreational use, and human health (fish contaminants) use for over 10 years. **In the 2014 IR, the Western Basin Shoreline Unit was listed as impaired for all four beneficial uses, including the public drinking water supply beneficial use for the first time.** Public drinking water supply intakes that are located in Lake Erie beyond 100 meters from the shore were associated with the nearest shoreline assessment units. An algae indicator assessment methodology was implemented for the first time in the 2014 report, based on the state drinking water thresholds for microcystins, saxitoxin, anatoxin-a and cylindrospermopsin. This association and application for assessment and listing has been clarified in response letters to U.S. EPA in 2015 and in this report. These impairment determinations were made based on numeric targets or standards and objective assessment methods for each use designation (see Sections E through H for more information about how impairment is determined for each use) in line with how assessments for large river and watershed units have been conducted for the last several report cycles.

For this 2016 IR, Ohio has continued to use the three Lake Erie shoreline assessment units with all four beneficial uses assessed and all Lake Erie public drinking water intakes associated with one of the three units, as shown in Figure D-3. The shoreline unit extends 100 meters from the actual shore. The 303(d) Prioritized List of Impaired Waters (Table L4) includes all three assessment units and shows that all three are now listed as impaired for aquatic life use, public drinking water use and human health (fish tissue). The western basin shoreline and central basin shoreline are also listed as impaired for recreation use by bacteria (*e. coli*).

The recreation use impairment should be expanded to include recreational contact with algal toxins. Ohio has established recreational algal toxin standards, monitored, and posted no swimming and no contact beach advisories so it is clear there is an impairment that needs to be listed. Ohio parceling out certain Lake Erie waters – nearshore – islands and leaving out the remaining Ohio Lake Erie open waters fails to include and assess Ohio western Lake Erie impairment sources. Lake Erie's waters have boundaries for Ohio's jurisdiction. The fact that Lake Erie lies in two countries and multiple states has not stopped Ohio from boating, fishing, vessel discharge, in

lake leases etc. The process is that Ohio administers its laws and then works with the other jurisdictions. Ohio is selectively picking parts of its Lake Erie waters for jurisdiction under the Clean Water Act and leaving the remaining to USEPA. Ohio is authorized by USEPA for administration of its Ohio's waters. If Ohio does not want jurisdiction over its Lake Erie open waters, then the Clean Water Act sections that Ohio has agreed to be administer need to be changed and assigned to USEPA which could be very problematic for Ohio's programs for Ohio Lake Erie open waters. Ohio's declaration of the western basin of Lake Erie – with Michigan doing the same in accordance with the US Clean Water Act is needed. Ontario is following its federal and provincial laws which can be coordinated on both sides of the border.

The Chesapeake Bay and other large watersheds have had voluntary agreements like the Great Lakes Water Quality Agreement Annex 4. All have failed. Instead, they now use the Clean Water Act Impaired TMDL Implementation process because this has an established framework for nutrient sources and amounts and reductions. The Annex 4 Domestic Action Plans for the states must include the Clean Water Act Impaired etc. process rather than dismissing it for an unproven arbitrary voluntary plan that by all accounts from other watersheds will fail to get the 40% nutrient reductions needed.

Comments on Section J – Ohio Integrated Report

As with other sections of this report, the presentation in information is overly complex and not reader friendly. Table J1 is clearly for the professional. HUC units, WQS, TMDL, 2008 IR acronyms are used confusing the reader. The section is highly technical and difficult to understand.

Section J2. Prioritizing the Impaired Waters: the 303(d) List

Ohio River and Open Waters of Lake Erie

Other organizations have lead responsibility for two special waters affected by multiple jurisdictions:

U.S. EPA for the open waters of Lake Erie and ORSANCO for the mainstem of the Ohio River. Ohio EPA is actively participating in TMDL and similar actions conducted by these organizations, so priority for *Ohio EPA-initiated action* is assigned a low priority for these waters. TMDLs in watersheds that drain to the Ohio River and Lake Erie will reduce the pollutant load delivered to each water.

This underscores the need for the open waters of the western basin of Lake Erie to be declared impaired. Ohio states that USEPA is responsible for Lake Erie's open waters and that USEPA is leading a TMDL – Ohio EPA needs to reference where USEPA is addressing Lake Erie's open waters with a TMDL etc. Ohio EPA has no coordinated TMDL for Lake Erie's tributaries – large rivers, bays, and streams.

Inland Waters and Lake Erie Shoreline

The chart in this section lists recreation as a source of impairment but Ohio EPA has elected not to include recreational use as a basis for impairment for Lake Erie. Ohio EPA states that the impairment designation is postponed until there are national

standards for recreational contact for algal blooms. But Ohio has established recreational standards for recreational contact for algal toxin blooms. Ohio places signs on beaches no to swim or come in contact with the water when monitoring exceeds Ohio's standards. Ohio needs to list the western basin of Lake Erie waters impaired for recreational contact, there is ample supporting data and additional information in Lake Erie's western basin open waters and on the shores

The AUs are assigned priority points using the guidelines in Table J-3. The points assigned to the public drinking water and human health uses are straightforward. For the recreation and aquatic life uses, points are assigned based on a computed index score (see Sections F2 and G2). The lowest quartile (scores between 0 and 25) get the fewest points because a TMDL may not be the most effective way to address the impairments. Scores in this range indicate severe basin-wide problems, comprehensive degradation that may require significant time and resources and broad-scale fixes, including, possibly, fundamental changes in land use practices. Education about the effects various practices have on water quality and encouraging stewardship may be more effective in these areas than a traditional TMDL approach. Scores in the highest quartile (between 75.1 and 100) generally indicate a localized water quality issue. Addressing the impairment may not require a complete watershed effort; rather, a targeted fix for a particular problem may be most effective. Thus, these receive the next lowest number of priority points. The most points are awarded for scores in the middle quartiles (between 25.1 and 50 and between 50.1 and 75), indicating problems of such scale that purposeful action should produce a measurable response within a 10-year period. These waters are the best candidates for a traditional TMDL.

The above explanation is based on the building of assumptions. If the land sources of the impairment are widespread then dismiss the impairment as taking too long to fix. This rationale is unsupportable.

Near Term Priorities for Ohio EPA

Ohio is facing increasing problems with cyanobacteria blooms in inland lakes, including development of HABs in source waters. Many public water systems are experiencing increased treatment costs to manage the extra carbon load and cyanotoxins at their intake. The smaller conventional systems will have difficulty treating water for these problems and the expense will be very high to upgrade those plants.
Lake Erie's water intake HAB sources need to be a high priority for Ohio EPA. The public water supplies for Lake Erie and its tributaries are experiencing hundreds of millions of dollars in cost to monitor and address toxins in the water intake. The algae toxin sources for all Lake Erie water intakes need to be a high priority for this report to be addressed. Safe Drinking Water Act source water planning and source reductions need to be a high priority for Ohio EPA.

J3. Addressing Nutrients in Lake Erie

Ohio is working to address its contribution to the problems in Lake Erie through nutrient TMDLs on tributaries; numerous state initiatives to reduce nutrient loads from Ohio; and active participation on Annex 4 (Nutrients) and other Great Lakes Water Quality Agreement (GLWQA) efforts. Effective lake management and coordinated implementation are needed to address the Western Basin of Lake Erie algal blooms and the Central Basin hypoxia issues, requiring a multi-state and binational effort.
Ohio includes the Clean Water Act 303d list Impaired Waters TMDL process where

it chooses to incorporate the TMDL's in the Great Lakes Water Quality Agreement Annex 4 process. Ohio needs to declare the western Lake Erie basin waters impaired followed by a basin wide TMDL. The western Lake Erie basin wide Clean Water Act Impaired TMDL process should be incorporated into the Annex 4 and serve as the framework for stakeholder agreement on basin wide sources and amounts. The arbitrary average weighted mean load for the Maumee River based on 2008 should be replaced with established Clean Water Act Impaired/TMDL processes. On one hand Ohio is saying that USEPA has an open water assessment for Lake Erie but on the other hand Ohio and USEPA have established priority western Lake Erie watersheds that do not include the open waters and which ignore the Detroit River nutrient contribution in western Lake Erie. The Annex 4 process which lacks a western basin Impaired TMDL, says that somehow the Detroit River nutrient contribution hops over fifty miles of waters in the western Lake Erie basin to only impact the Central basin, an absurd assumption.

Recent assessments by the Ohio Phosphorus Task Force (Phases I and II) and Annex 4's Objectives and Targets Task team indicate nonpoint sources are the primary source. A key challenge for nutrient management is to assess and manage both in-stream (near-field) and downstream (far-field) impacts in the receiving water body (Lake Erie). To improve water quality in Lake Erie, a separate and independent analysis is needed to determine in-lake goals and seasonal/annual load reductions targets for the tributaries. Ohio is directly involved in developing these goals and reduction targets needed for Lake Erie while moving forward on developing implementation strategies and taking action.
The Clean Water Act Impaired Water TMDL process is established to determine in lake and tributary load reductions goals. USEPA and Ohio are required to comply with the Clean Water Act which in part was created because of the algae and other toxins in Lake Erie decades ago.

Recognizing there may be confusion about the multiple initiatives and how they fit together to improve Lake Erie, an outline and explanation of linkages is provided below.
Declaring the western basin of Lake Erie impaired and following the TMDL assessment and reportable accountable implementation plan would form the basis for the GLWQA Annex 4 Domestic Action Plans in the US and make all of the below explanations come together as a unified rather than piecemeal plan.

Great Lakes Water Quality Agreement

Binationally, the U.S. and Canada are working together under the GLWQA to develop nutrient reduction strategies; come to agreement on phosphorus reduction targets for Lake Erie; and create and implement action plans to meet the targets.
For the US, these reduction targets and the methodology of determining them have to comply with the Clean Water Act rather than being independent of the Clean Water Act.

Annex 4 of the 2012 GLWQA specifically addresses nutrients in the Great Lakes and contains short-term requirements specific for Lake Erie. U.S. EPA has indicated to Ohio that it agrees that the Annex 4 process is the best way to protect Lake Erie for the four states and one province that share the shoreline.

Work under Annex 4 includes the following:

- Develop binational phosphorus loading targets for Lake Erie (by February 2016)

  - Released summer 2015 with public consultation and comment period
  - Final targets/objectives will be included in the binational nutrient management strategy for Lake Erie and will include allocation by country and watershed
- Develop Binational Nutrient Management Strategy (by June 2016), and
- Develop Domestic Action Plans to meet the targets (by April 2018).

All of the above should be compliant with the US Clean Water Act.

Annex 2 of the GLWQA provides the framework for long-term binational management of the Lake. A comprehensive LAMP has been developed for Lake Erie and is the binational platform where whole lake management plans are developed, implemented and tracked. Ohio is a key partner in the binational partnership. For example, Annex 2 calls for creation of a new nearshore framework and the binational partnership will be responsible for implementing the framework and reporting on progress. It is also expected that the nutrient targets from Annex 4 will be incorporated in the next version of the lake- wide management plans. Working through the binational partnership is critical for developing a coordinated approach with consistent reporting across the borders.

USEPA is no longer funding the LAMP's and their utility and roll are in transition. Again Ohio should follow the requirements for determining sources and amounts with stakeholder agreement followed by an accountable reportable implementation plan.

Great Lakes Commission: Lake Erie Nutrient Targets (LENT) Working Group

The Great Lakes Commission formed the Lake Erie Nutrient Targets (LENT) Working Group as a result of a 2014 resolution that committed the Lake Erie states and the province of Ontario to develop new and refine existing practices, programs and policies to achieve pollutant reduction targets and identify additional remedies to improve water quality in Lake Erie. This is a state/province initiative that is parallel, but separate from the binational GLWQA and Annex 4 efforts. Ohio is a member of the LENT Working Group. The LENT Working Group released a Joint Action Plan for Lake Erie on September 29, 2015, available at http://glc.org/projects/water-quality/lent/.
As identified in this section, there are too many independent pieces that fail to provide agreed upon sources and amounts western Lake Erie basin wide using the TMDL framework with stakeholder agreement on the amounts to then agree upon reductions and a plan.

Lake Erie Collaborative Agreement

The Lake Erie Collaborative Agreement is another state/province led-initiative; it was signed in June 2015 by Ohio, Michigan and Ontario (http://www.cglslgp.org/media/1590/western-basin-of-lake-erie- collaborative-agreement-6-13-15.pdf). The three parties in the agreement are supportive of the binational Annex 4 effort, but recognize that immediate actions can be implemented at the state and provincial levels. In order to get a head start on the Annex 4 process and hasten efforts to improve water quality in Lake Erie, Ohio released a draft Collaborative Implementation Plan in June 2016. The Annex 4 domestic action plans will build on the Collaborative's short-term goals and the implementation plans will become the long-term plans. One of the goals spelled out in the Collaborative Agreement is to reduce nutrient levels going into Lake Erie by 40 percent. The other is to develop a strategic plan to manage dredge material in order to ensure it complies with the state's recent

commitment to stop open lake disposal of dredge material into Lake Erie by 2020. The GLWQA does not contain timeframes for implementation and restoration goals, but Ohio is working to meet the Collaborative Agreement phosphorus reduction goals of 20 percent by 2020 and 40 percent by 2025.
As identified in this section, there are too many independent pieces that fail to provide agreed upon sources and amounts western Lake Erie basin wide using the TMDL framework with stakeholder agreement on the amounts to then agree upon reductions and a plan

TMDLs for Lake Erie Watershed
TMDLs are conducted by the state or federal governments as required under the CWA for waters that have been formally identified as impaired. TMDLs use monitoring and modeling to identify where load reductions and restoration actions are needed. Ohio EPA plans to utilize this tool to target implementation in Ohio's Lake Erie watersheds as it works to meet the Annex 4 phosphorus targets and allocations.
As identified in this section, there are too many independent pieces that fail to provide agreed upon sources and amounts western Lake Erie basin wide using the TMDL framework with stakeholder agreement on the amounts to then agree upon reductions and a plan. Picking and choosing TMDL's etc. rather than a basin wide TMDL fails to provide a coordinate Lake Erie reduction plan.

TMDLs are a document that provides guidance on where to focus implementation and recommends BMPs. The TMDL process does not provide additional authority to either Ohio or U.S. EPA to regulate nonpoint sources of pollution; Ohio's regulatory tools are limited to permits and enforcement actions against point sources of pollution.
The Chesapeake Bay federal lower court and appellate court decisions dispute this. This is a legal discussion that should not be in the Ohio Integrated Report.

Ohio has completed TMDLs[8] for 22 of 32 project areas (watersheds) feeding into Lake Erie and work on the remaining 10 watersheds is underway by either Ohio EPA or a contractor for U.S. EPA. All of these TMDLs employ the State's narrative water quality (WQ) criteria for phosphorus with established targets and methods to address "near field" impacts on rivers and streams. Because Ohio lacks a WQS criterion for total phosphorus concentration in Lake Erie, TMDLs were not developed to address the excessive wet weather loads delivered to Lake Erie. Ohio currently assesses the shoreline zone (shoreline out to 100-meters) of Lake Erie and the aquatic life use is designated as impaired by nutrients, among other

[8] While Ohio has completed these TMDLs and they were approved by U.S. EPA, in March 2015 in *Fairfield Cty. Bd. of Commrs. v. Nally,* 143 Ohio St. 3d 93, 2015-Ohio-991, the Ohio Supreme Court determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act." See Section C (page C-17) for more details.

Ohio has failed to conduct a TMDL in any of Lake Erie's watersheds that would remove the algae related impairments because none of the TMDL's, according to this section, included Wet Weather Loads delivered to Lake Erie. It is widely acknowledged that up to 80% of the nutrient

sources that create the toxic algae in Lake Erie come from wet weather events. This 'theory' is verified by the years 2012 and 2016 which were near drought years. Ohio EPA must include wet weather in all Lake Erie watershed Existing Lake Erie watershed TMDL's must be updated to include wet weather.

Not considering wet weather has also been a problem for Ohio setting nutrient standards as required by the Clean Water Act. In response to USEPA's request for Ohio to establish nutrient standards, the Ohio Phosphorus Task Force Committee has a Technical Advisory Committee that was supposed to establish nutrient standards. The committee decided to start with establishing a nutrient standard for small streams and the standard that was proposed was only for low flow – there was an objection by the Lake Erie Improvement Association – the small stream nutrient standard has not been set after two years of meetings.

Ohio is holding nutrient point sources to one standard and nonpoint to no standard. This is unacceptable.

There have been questions regarding the Chesapeake Bay approach (federally-led multi-state TMDL) and whether it would be appropriate for Lake Erie's Western Basin. The difference is Lake Erie is bordered by another country and already has a binational governance framework (GLWQA) and implementation tool (Annex 4 Domestic Action Plans) in place. Ohio and the other Lake Erie partners are working with U.S. EPA to understand what worked well under the Chesapeake Bay TMDL and build those tools or actions into the Domestic Action Plans. The Annex 4 process of developing loading targets and Domestic Action Plans are essentially identical to the TMDL process but have the added advantage of being binationally managed according to the GLWQA. Key steps in each process are depicted in Figure J-6.

A basin wide Clean Water Act/TMDL that has been done for the Fox/Green Bay, the Mississippi, Everglades and other large watershed in the US provides impairment sources and amounts and determines the load for, in this case, nutrients.
Ontario is using Canadian and Ontario water laws to form their Domestic Action Plan. The US Lake Erie states should do the same.

Ohio-based Efforts

Recognizing that Ohio's watersheds provide a significant amount of nutrients to Lake Erie and that its communities are bearing the brunt of algal bloom impacts, Ohio launched a series of initiatives at the state-level back in 2010 and has expanded the scope and scale of implementation; developed a statewide strategy; targeted funding; and undertook legislative action to address the problem. Since 2011, the Ohio has invested more than $1 billion in the Lake Erie watershed to improve drinking water and wastewater facilities; monitor water quality; plant cover crops; recycle dredge material; install controlled drainage systems on fields; and fix failing septic systems. In addition, Ohio has received more than $11 million from the Great Lakes Restoration Fund for water quality improvement efforts in the Lake Erie watershed.

The following is a list of several state-led and statewide water quality improvement activities.

1. **Statewide Nutrient Reduction Strategy:** Ohio's environmental, agricultural and natural resource agencies worked together to create a statewide strategy to reduce nutrient loading to streams and lakes, including Lake Erie. The strategy was submitted to U.S. EPA-Region 5 in 2013. Ohio EPA is currently updating the strategy to address gaps identified through U.S. EPA's review. The strategy and more information about the effort are available at http://www.epa.ohio.gov/dsw/wqs/NutrientReduction.aspx.

2. **GLRI Demonstration and Nutrient Reduction Projects:** Nine grants totaling over $12 million were awarded to Ohio. Highlights include: first saturated buffer installed in Ohio; 53 controlled drainage structures installed; 52 whole farm conservation plans developed; 7,500 acres of cover crops planted; and 29 storm water, wetland and stream restoration projects in Cuyahoga County.

3. **Ohio Senate Bill 1:** This bill, effective July 3, 2015, requires major public-owned treatment works (POTWs) to conduct technical and financial capability studies to achieve 1.0 mg/L total phosphorus; establishes regulations for fertilizer or manure application for persons in the western basin[9]; designates the director of Ohio EPA as coordinator of harmful algae management and response and requires the director to implement actions that protect against cyanobacteria in the western basin and public water supplies; prohibits the director of Ohio EPA from issuing permits for sludge management that allow placement of sewage sludge on frozen ground; and prohibits the deposit of dredged material in Lake Erie on or after July 1, 2020, with some exceptions.

[9] "Western basin" is defined in this Senate Bill as consisting of the following 11 watersheds: Ottawa watershed, HUC 04100001; River Raisin watershed, HUC 04100002; St. Joseph watershed, HUC 04100003; St. Mary's watershed, HUC 04100004; Upper Maumee watershed, HUC 04100005; Tiffin watershed, HUC 04100006; Auglaize watershed, HUC 04100007; Blanchard watershed, HUC 04100008; Lower Maumee watershed, HUC 04100009; Cedar-Portage watershed, HUC 04100010; and Sandusky watershed, HUC 04100011.

4. **Ohio Senate Bill 150**: This bill, effective August 21, 2014, requires, among other things, that beginning September 31, 2017, fertilizer applicators must be certified and educated on the handling and application of fertilizer; and authorizes a person who owns or operates agricultural land to develop a voluntary nutrient management plan or request that one be developed for him or her.

5. **Ohio HB 64**: This bill, effective June 30, 2015, requires the development of a biennial report by spring 2016 on mass loading of nutrients delivered to Lake Erie and the Ohio River from Ohio's point and nonpoint sources. A summary of the bill is available at https://www.legislature.ohio.gov/legislation/legislation-summary?id=GA131-HB-64.

6. **Ohio Clean Lakes Initiative:** The Ohio General Assembly provided more than $3.5 million for projects to reduce nutrient runoff in the Western Lake Erie Basin.

7. **Healthy Lake Erie Initiative**: The Ohio General Assembly provided $10 million to the Healthy Lake Erie Initiative to reduce the open lake placement of dredge material into Lake Erie. These sediments often contain high levels of nutrients or other contaminants so finding alternative use or disposal options is a priority.

8. **Targeted Funding to Ohio Drinking Water and WWTPs**: More than $150 million was made available starting in 2014 to help public water systems keep drinking water safe and to help wastewater treatment plants reduce the amount of phosphorus they discharge into the Lake Erie watershed. As of June 2016, over $61 million had been awarded for this work and most of the remainder has been allocated for specific projects.

9. **Directors' Agricultural Nutrients and Water Quality Working Group:** This is a collaborative working group that consists of participants from Ohio EPA, ODA and ODNR. The group's report contains a number of recommendations to be implemented during the next several years. For example, the report recommends ways for farmers to better manage fertilizers and animal manure and also provides the state with the means to assist farmers in the development of nutrient management plans and to exert more regulatory authority over the farmers who are not following the rules. The report is available at http://www.agri.ohio.gov/topnews/waterquality/docs/FINAL_REPORT_03-09-12.pdf.

10. **Ohio Lake Erie Phosphorus Task Force Phase 2**: The Task Force, which includes participants from Ohio EPA, ODA and ODNR, originally met back in 2009 and was brought back together in 2012 to build on its previous work and make recommendations for improving water quality in the Lake Erie watershed. The taskforce finalized the latest report in 2014 and it is available at http://lakeerie.ohio.gov/Portals/0/Reports/Task_Force_Report_October_2013.pdf.

11. **Ohio Point Source and Urban Runoff Workgroup:** Businesses, municipalities and Ohio EPA came together to initiate the "Point Source and Urban Runoff Workgroup" in 2012 in order to identify actions that can be taken immediately to reduce phosphorus loadings from WWTPs, industrial discharges and urban storm water. The group's full report is available at http://epa.ohio.gov/portals/35/documents/point_source_workgroup_report.pdf.

All of these efforts need to be incorporated into the basin wide TMDL and the implementation plan which would determine if there are nutrient reductions that will lead to removal of the Lake Erie nutrient impairment. Furthermore, Ohio TMDL's do not have Implementation Plans with tracking for reductions of the impairment. Ohio goes through a TMDL process and then there is no plan for most of the TMDL's – certainly no plans for nutrient TMDL's.

Ohio has determined that Lake Erie Recreational Use cannot be declared impaired because USEPA has not developed recreational standards. Yet Ohio has established its own standards as listed on Ohio

and USEPA websites. Since Ohio has established recreational standards for beach closings related to algal toxins, Ohio must determine Lake Erie waters that are impaired for recreational contact, and not wait two years until the federal standards are established.

The charts below do not show the status of implementation plans and the amount of reductions achieved as a result of the plan/TMDL. This needs to be included in the charts.

ssessment Unit	Assessment Unit Name	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
24001 001	Lake Erie Western Basin Shoreline (including Maumee Bay and Sandusky Bay)	5	5	5	5	14	2020
24001 002	Lake Erie Central Basin Shoreline	5	5	5	5	14	2020
24001 003	Lake Erie Islands Shoreline	5	1	5	5	8	2020

These Assessment Units delay field monitoring until 2020 in the Lake Erie Watershed. Waiting until 2020 is unacceptable

This section should include a basin wide TMDL for Ohio's western Lake Erie Watershed

This section should add recreational contact re. algae/toxins

LUCAS COUNTY

OREGON on the bay
City of Opportunity

Tina Skeldon Wozniak, President of Commissioners
Commissioner Carol Contrada
Commissioner Peter L. Gerken

Melissa M. Purpura, Law Director

August 29, 2016

Ohio EPA
Division of Surface Water, P.O. Box 1049
Columbus, Ohio 43216-1049
dsw.webmail@epa.ohio.gov

Attn: 303(d) Comments

On behalf of Lucas County and the City of Oregon, please accept these comments in response to the July 29, 2016 Notice of Availability and Request for Comments Federal Water Pollution Control Act Section 303(d) TMDL Priority List for 2016. Our comments center not only on the priority list but also on the analysis and information in the Ohio 2016 Integrated Water Quality Monitoring and Assessment Report Final Draft (Integrated Report).

The Toledo and Oregon water intakes are located offshore in Lake Erie in Lucas County. All Lucas County residents and thousands of residents in adjacent counties rely on these intakes for their water service. The intakes experience harmful algal blooms that sometimes include the toxin microcystin. In 2014, the Toledo intake incurred levels of microcystin that resulted in Toledo water customers being told not to drink the water. In 2015, Lake Erie experienced a record algae bloom. Both Oregon and Toledo are spending millions of dollars in additional treatment and equipment to increase the ability to keep the microcystin from entering the drinking water. These costs will be largely assessed to Toledo and Oregon water customers.

We are concerned that Ohio is not following the Federal Clean Water Act requirements to reduce the sources of the nutrients that cause the harmful algal blooms. It is widely acknowledged that the primary source of the nutrients – mainly dissolved reactive phosphorus – come from non-point agricultural runoff after heavy rains. In the Integrated Report, Section C Nonpoint 319 page 11, Ohio has minimal goals for nonpoint nutrient reduction in Lake Erie and no specific targeted amounts of phosphorus. The Nonpoint Management Plan in this report references the Ohio Water Resources Council as the workgroup to develop a plan; but while referencing this Council, the State is at the same time proposing legislation to eliminate the Council.

Ohio needs to meet the requirements of the Federal Clean Water Act to be authorized to administer the Clean Water Act provisions and grants from the federal government.

The Ohio Integrated report is required under the Clean Water Act 33 U.S.C. Section 1251 et. seq. Ohio's code to comply with the various sections of the Clean Water Act states in 3745-1-01 as stated below and in Antidegredation 3745-1-05. ***Ohio has failed to establish nutrient water quality standards as required.***

> " (A) It is the purpose of these water quality standards, Chapter 3745-1 of the Administrative Code, to establish minimum water quality requirements for all surface waters of the state, thereby protecting public health and welfare; and to enhance, improve and maintain water quality as provided under the laws of the state of Ohio, section 6111.041 of the Revised Code, the federal Clean Water Act, 33 U.S.C. section 1251 et seq., and rules adopted thereunder.
>
> (B) Whenever two or more use designations apply to the same surface water, the more stringent criteria of each use designation will apply.
>
> (C) These water quality standards will apply to all surface waters of the state except as provided in paragraph (D), (E), or (F) of this rule. Compliance schedules may be granted pursuant to rule 3745-33-05 of the Administrative Code.
>
> (D) These water quality standards will not apply to water bodies when the flow is less than the critical low-flow values determined in rule 3745-2-05 of the Administrative Code."

The Ohio criteria that applies to all waters as stated in 3745-1-04 Section E states:

> "(E) Free from nutrients entering the waters as a result of human activity in concentrations that create nuisance growths of aquatic weeds and algae.-;"

The US Clean Water Act 33 USC 1329 R.C. 119.032 review dates: 03/29/2007 and 03/29/2012

> **"(a)STATE ASSESSMENT REPORTS**
>
> **(1) CONTENTS** The Governor of each State shall, after notice and opportunity for public comment, prepare and submit to the Administrator for approval, a report which—
>
> **(A)**
>
> identifies those navigable waters within the State which, without additional action to control nonpoint sources of pollution, cannot reasonably be expected to attain or maintain applicable water quality standards or the goals and requirements of this chapter;
>
> **(B)**
>
> identifies those categories and subcategories of nonpoint sources or, where appropriate, particular nonpoint sources which add significant pollution to each

portion of the navigable waters identified under subparagraph (A) in amounts which contribute to such portion not meeting such water quality standards or such goals and requirements;

(C)

describes the process, including intergovernmental coordination and public participation, for identifying best management practices and measures to control each category and subcategory of nonpoint sources and, where appropriate, particular nonpoint sources identified under subparagraph (B) and to reduce, to the maximum extent practicable, the level of pollution resulting from such category, subcategory, or source; and

(D)

identifies and describes State and local programs for controlling pollution added from nonpoint sources to, and improving the quality of, each such portion of the navigable waters, including but not limited to those programs which are receiving Federal assistance under subsections (h) and (i) of this section."

The sections referenced above at minimum show that Ohio may be failing to meet the requirements of the Clean Water Act by not setting nutrient standards and by not complying with Section 319 Nonpoint Source Management.

In addition to the failure to set nutrient standards as noted above, the State of Ohio risks Federal Clean Water Act violations in its approach to drainage water management.

3: Drainage Water Management Strategies ***Goal 3.03.01—Reduce the rate and amount of runoff***

"Perhaps the single most important action that can be taken to reduce nutrient loadings and impacts on Ohio streams is to reduce the rate and amount of runoff from agricultural production areas. For decades, grass filter strips (FSA CP-21) have been advocated as important tools to provide a buffering media for sheet flow runoff and cost-share funding has resulted in the installation of many thousands of acres of these practices. Unfortunately, a very small percentage of CP-21 "filter strips" are designed to disperse and filter runoff from each discreet contributing drainage area. Likewise, there is very little actual filtration of surface runoff from contributing cropland because FSA CP-21 filter strips (designed as conservation cover standard FOTG 327) are mostly bypassed by concentrated flow runoff. In addition, a significant percentage (estimated at between 25-75% in any given year, N. Fausey, USDA- ARS personnel communication) of the total drainage from farm fields in Ohio is flowing through sub- surface tiles and discharges directly into waterways without ever passing through a filter strip. There is an important need for improvements in the design and installation of edge-of-field buffers so they are more environmentally effective at reducing rate and volume of runoff and treatment. As an example, this includes installing filtering *areas* rather than strips that are specifically designed to capture, retain or disperse runoff. The challenge is

convincing farmers and other landowners that these alternative drainage designs can be installed while still maintaining the overall functionality of the drainage systems and crop yields. Reducing the rate and amount of runoff will require:

- More effective edge of field buffer areas
- Water control devices that retain nutrient laden waters in subsurface drain tiles
- Cover crop planting as part of a long-term conservation crop rotation
- Drainage water management devices on surface and subsurface tile drain outlets

Drainage water management practices, also known as controlled drainage are an important emerging set of tools for dealing with field runoff and mitigating the impacts of tile drainage. Several NRCS approved practices that help with drainage water management include:

- Drainage Water Management (554)
- Structure for Water Control (587)
- Filter Strips/Areas (393)
- Wetland Creation (658)

Goal 3.01.02—Reduce nutrient loss.

Objective 3.01.02(A): Limit the application of livestock manure and fertilizer to those levels that meet agronomic need of the crop(s) being grown. Although this objective seems straight forward, it will actually be a considerable challenge. Recognizing this challenge, successful implementation of this objective will be measured by:

- Provide funding and/or encourage the successful completion of at least 100 nutrient management plans annually during the first three programming years.
- Implement "4-R's" training program in association with the ODNR's "Clean Lakes Initiative".
- NPS Program staff participation on all applicable USDA-sponsored workgroups revising NRCS Field Guide Standards for Nutrient Application, Waste Utilization, Manure Management under NRCS Standard 590—Nutrient Management, and other water quality related discussions."

Though these strategies have existed since 2005, many of these strategies have not been incorporated into Ohio's 319 grant process or put into State of Ohio rules for non-point management. We recommend that Ohio require a true agronomic rate of application of manure as opposed to permitting a rate of application more consistent with waste disposal of manure.

We recommend that Ohio consider the State of Virginia's Non-point Source program which shows actual units of nutrient and other non-point inputs and reports specific, verifiable reductions and progress.

http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/NonpointSourcePollutionManagement/NonpointSourceManagementPlan.aspx

http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/NonpointSourcePollutionManagement/NonpointSourceAnnualReports.aspx

The City of Oregon and Lucas County have asked both the State of Ohio as well as the U.S. Environmental Protection Agency to declare Western Lake Erie Impaired, which should trigger a basin-wide Total Maximum Daily Load process. The basin-wide TMDL would identify sources and amounts of both point and non-point nutrients responsible for the harmful algal blooms and the resultant toxins at the Toledo and Oregon water intakes. In any case, we recommend Ohio incorporate measurements during wet weather events in both existing and future TMDL processes. Failure to include measurements of nutrient runoff during wet weather events in existing and future TMDLs will undercut meaningful efforts to reduce the greatest source of Lake Erie's harmful algal blooms – nutrient runoff from wet weather events which are occurring at greater frequency and intensity. It is difficult to envision a solution to our region's harmful algal bloom problem without starting from genuine knowledge of sources and amounts of nutrients in our source waters.

Further, we object to the State of Ohio proposal to combine the Toledo and Oregon intakes with the near shore area assessment units. These intakes are clearly in the open waters of Lake Erie, well beyond the 100-meter boundaries of existing near-shore assessment units.

For the above stated reasons, we recommend that Ohio:

1. More forcefully adopt the federal Clean Water Act requirements and guidelines for addressing excessive nutrients;
2. Revise its Integrated Water Quality Report to declare the Ohio waters in the western basin 'Impaired' which would include Ohio's open waters and the Oregon and Toledo water intakes;
3. Update and include wet weather measurements in all Lake Erie watershed TMDLs;
4. Revise Ohio's Non-point Source Plan, using Virginia and other states as a model, to report actual nutrient reduction and to propose rules to the Ohio Department of Agriculture to limit the application of manure to the agronomic/4R rate.

We stand willing to collaborate with the State of Ohio's efforts to reduce harmful algal blooms.

Sincerely,

John Borrell

John Borrell, Assistant Lucas County Prosecutor
Board of Lucas County Commissioners

Melissa M. Purpura

Melissa M. Purpura, Law Director
City of Oregon

From:	Harris, Melinda
To:	Alexander, Cathy; Babb, Rahel
Subject:	FW: Lake Erie is at Risk
Date:	Monday, August 29, 2016 3:23:44 PM
Attachments:	image001.png

Melinda Harris
TMDL Supervisor / Rules Coordinator
Division of Surface Water
Ohio Environmental Protection Agency
50 W. Town Street, Suite 700
Columbus, Ohio 43215
(614) 728-1357

Ohio
Ohio Environmental Protection Agency

From: Keleen McDevitt [mailto:Keleen@gascogas.com]
Sent: Monday, August 29, 2016 3:09 PM
To: EPA dsw.webmail <dsw.webmail@epa.ohio.gov>
Subject: Lake Erie is at Risk

To Whom it May concern:

Thank you for this opportunity to submit comments on Ohio's Clean Water Act Lake Erie water quality.

I can attest to the algae interfering with our lives. Born in 1963, I grew up and learned how to swim on Lake Erie.

About 2 weeks ago, the shoreline as well as over 100 ft. out from my beach is now topped with Green algae preventing me and my grandkids from swimming.
Last year, we didn't pay much attention and swam anyway; we all ended up at doctor at least once with ear infections.

If we don't do anything this will only get worse. We must join forces with those who walked before us, put processes in place, and save this great lake for future generations.

Sincerely,

Keleen McDevitt

From: MARJ MULCAHY
To: EPA dsw.webmail
Subject: 303(d) Comments
Date: Monday, August 29, 2016 4:26:16 PM

Ohio EPA
Division of Surface Water, P.O. Box
1049, Columbus, Ohio 43216-1049
dsw.webmail@epa.ohio.gov

Attn: 303(d) Comments

Thank you for this opportunity to submit comments on Ohio’s Clean Water Act Lake Erie water quality. Lake Erie is the drinking water source for 11 million people and is vital to Ohio’s economy.

The following is requested:

1. That the western basin of Lake Erie be declared impaired and that the Toledo and Oregon intakes be part of the basin wide impairment rather that the proposed near shore area which is not a major contributor to the intake algae.

2. That Ohio EPA include wet weather in assessing nutrient runoff.

3. That Ohio EPA include algae/toxin’s in its **recreational contact** impairments.

4. That Ohio EPA provides an **annual report** to the public that identifies **sources and amounts** of Lake Erie algae/nutrients and **how many pounds/units** are reduced from the funding/changes to reduce nutrient runoff.

5. **That Ohio EPA request the Ohio Department of Agriculture to create rules that LIMIT MANURE APPLICATION OF PHOSPHORUS TO THE CROP NEED/AGRONOMIC NEED/AMOUNT.**

6. That the report be MORE USER FRIENDLY. It is extremely difficult for the layperson to navigate and understand.

Sincerely,

Marjorie Mulcahy
Toledo, Ohio
memulcahy@sbcglobal.net

National Wildlife Federation
Comments on the July 2016
Ohio 2016 Integrated Water Quality Monitoring and Assessment Report

August 29, 2016

Introduction

The National Wildlife Federation (NWF) offers the following comments on the draft 2016 Integrated Water Quality Report. Our comments focus on the sections of the report relating to Lake Erie. We are dismayed that Ohio EPA chose not to pursue the framework and methodology proposed for Lake Erie in the 2014 Integrated Report. And while not pursuing the 2014 proposed methodology, Ohio EPA offers no new or additional approach towards addressing the open waters of Lake Erie. We believe the Integrated Report could be improved by addressing these issues and we offer a new approach discussed below.

Section D-3, Page D-6

In 2014, Ohio EPA proposed a reasonable, robust framework and methodology for assessing the Ohio open waters of Lake Erie in its Integrated Report. In 2016, the limited explanation provided for not pursuing this approach is that the Great Lakes Water Quality Agreement (GLWQA) targets resulted in load reduction targets rather than in-lake nutrient concentrations or criteria and that the as a binational water the USEPA should take the lead in assessment and listing. And while Section D-3 mentions "others reasons" in Section J-3 for not pursuing the proposed framework, none of the information in J-3 provides additional context for this decision.

The justification that the GLWQA targets resulted in nutrient load reductions rather than concentrations as the rationale for not pursuing the proposed methodology is confounding. The 2014 proposed framework and methodology was not based solely on the premise of a total phosphorus or chlorophyll a standard or target. Rather, in 2014 Ohio EPA proposed several other data parameters and data sources. In Section I5.2 Ohio EPA acknowledged "data is now available to evaluate the nearshore and offshore waters and the proposed framework expands the evaluation to cover all of Ohio's Lake Erie waters." While NWF supports the rationale for not including total phosphorus concentration levels in the GLWQA targets, the absence of a concentration target is not an adequate rationale not to implement the rest of the assessment methodology as presented in 2014.

The other explanation Ohio EPA provides for not pursuing the 2014 proposed approach is the assertion that USEPA should take the lead for assessment and listing of the open waters. Regardless of USEPA action, Ohio has responsibility for all of its jurisdictional waters and a duty of care to the public to assess and report on the condition of all public waters. In Section D-3 of the 2016 Integrated Report Ohio EPA expresses its willingness to assist federal partners, yet little has been done at the state or federal level to resolve this issue. The following paragraphs outline a new approach that seeks to address the call for an impairment designation for Lake Erie with an associated TMDL intended to provide an accountability framework for nutrient reductions. Rather than defer to a federal agency, Ohio EPA should seek to carry out work under its authority to align different programs, both state and federal, to achieve the shared goal of a restored Lake Erie.

It is well-documented that the significant annual harmful algal blooms of the western basin of Lake Erie is largely driven by the nutrient loads from the Maumee River. Rather than defer to USEPA or assert the absence of a concentration value, Ohio could address the loading issue in ways that align state programs and processes with federal and binational efforts. Simply providing the list of current activities by all parties (as in Section J-3) is not sufficient to synthesize and leverage these efforts collectively. This list also does not capture all the authorities available to the state to address the relevant Lake Erie water quality problems.

An Alternative Approach

One approach Ohio EPA could take is to reframe its Assessment Unit framework beyond the limitations of the shoreline geography and propose a new unit(s) that aligns with loading at the mouth of the Maumee River. Section G-6 of the Integrated Report defines lacustuary, the zone where Lake Erie water levels have intruded into tributary river channels and describes the extensive body of work that led to defining these waters. This zone could be its own Assessment Unit.

A lacustuary-based Assessment Unit could then be aligned with the GLWQA targets for the Maumee River basin (as well as other major tributaries draining to Lake Erie). The GLWQA target for spring for the Maumee River equates to 860 tons of total phosphorus and 186 tons of DRP. We recommend using a Flow-Weighted-Mean-Concentrations (FWMC) equivalent as a benchmark to track progress in load reduction during a specific period (e.g., annually or March-July) and address variability by year with respect to flow. A lacustuary-defined Assessment Unit would enable Ohio EPA to make an impairment determination for that AU and apply a nutrient concentration number to a meaningful geography and serve as the basis for a TMDL. The target load and/or FWMC can then be sub-allocated to the watersheds in the Maumee River basin and provide the basis for future TMDLs. This approach would establish a basin-wide framework for TMDLs and provide a mechanism for tracking progress across the basin.

Linking the GLWQA target for the Maumee River basin with the TMDL program is an opportunity synchronize state programs and processes with those at the federal and binational level. A comprehensive approach towards meeting the 40% reduction target and reducing algal blooms is necessary regardless of impairment status of individual water bodies or assessment units.

Figure J-1, Page J-3

The figure is used to illustrate how the listing process changed from 2008 to 2010, including reporting at finer assessment unit sizes. Though the figure is discussed in the narrative, it would be helpful to have brief description following the figure of the meaning of the letters (A,R,H,P) and the lowest letters and numbers (4A, 5, 0, etc.).

Open Waters of Lake Erie, Page J-4

At the start of Section J-2, Ohio EPA indicates USEPA has "lead responsibility" for the open waters of Lake Erie (p. J-4). While USEPA is involved in multiple efforts on Lake Erie, including through Annex 4 of the GLWQA, we are not aware that USEPA has formally acknowledged it is taking the lead on a Lake Erie TMDL or otherwise announced a regional TMDL. Should USEPA begin such an effort, it would most likely start with listing decisions already made by the relevant states (i.e., Ohio and Michigan), as it did in the development of the Chesapeake Bay TMDL, when it used listing/impairment decisions from 2008 lists from the relevant jurisdictions (Delaware, District of Columbia, Maryland, and Virginia) as the basis for

the regional TMDL (see USEPA 2010, Chesapeake Bay Total Maximum Daily Load for Nitrogen, Phosphorus and Sediment, Section 2).

Inland Waters and Lake Erie Shoreline, J-4
The text (last paragraph of p. J-4) describe the assigning of priority points to assessment units, and references "guidelines" in Table J-3. However, Table J-3 only identifies the number of assessment units in a particular point group for four different designated use areas, not how the points/scores were developed and applied to assessment units. There is reference to Section C8 in this section, but even there, limited discussion is available on the actual process used. There should be some type of summary description (including possibly with examples) of the development and application of the point/scoring system for prioritizing listed waters.

Near Term Priorities for Ohio EPA, Page J-6 et seq.
It is helpful to have indications of near-term priorities through the TMDL and related programs, though the presentation in this discussion is not completely clear. For example, the report identifies three lakes/reservoirs as priorities for the next few years (Tappan Lake, W.H. Harsha Lake, and Clyde/Beaver Creek Reservoir), but then the subsequent (non-numbered) table (Page J-6) identifies four assessment units formally on the impaired waters lists, and it is not clear if any of the aforementioned lakes/reservoirs would be formally addressed through TMDLs of the listed assessment units. Additional text here will help clarify this matter.

Section J, Page J-11, 2nd paragraph
This paragraph includes the statement: "To improve water quality in Lake Erie, a separate and independent analysis is needed to determine in-lake goals and seasonal/annual load reductions targets for the tributaries." This analysis was recently completed through the GLWQA Annex 4 process and a separate analysis is duplicative and unnecessary, in particular absent any new information indicating limitations in the Annex 4 process and results. Elsewhere in the Integrated Report, Ohio EPA supports the targets established and adopted as part of the GLWQA. An explanation is needed as to the intent behind the statement that any additional analysis is needed and worthy of public sector investment to determine targets different from those adopted as part of the GLWQA.

Section J, Page J-13, Figure J-6
The figure includes the phrase: "Currently no established standards for Lake Erie". This must be in error given the Ohio rule OAC 3745-1-31 establishes the designated uses and associated criteria for Lake Erie. Any such statement in the figure should be more precise on what is missing in this section of the administrative code.

The second row of this figure contrasts TMDLs as determining daily load with Annex 4 providing load allocation by country and watershed. Ohio EPA has a long history of developing TMDLs by hydrologic areas (watersheds) but there is no mention of TMDL geography, only that TMDLs develop daily loads. A more thoughtful analysis of these two programs is warranted beyond this (limited) side by side contrast. Ohio EPA is in a unique position to demonstrate how these processes can align and work towards the common goal of reducing nutrients into the Lake.

Section J, Page J-16
This section (including Table J-4) summarizes outcomes of the current listing process. However, Ohio EPA should ensure terms are being appropriately used. For example, the initial discussion in the section references "the number of TMDLs continues to rise…" while Table J-4 appears to describe assessment

results generally for 2016. It may be that the number of developed TMDLs continues to rise, but again, the agency should ensure the language is accurate, and in any case, it would be informative to briefly describe a broader sense of progress (e.g. related to information provided in Figures J-7 – J-9, and how impairment data have changed in recent cycles.)

Section J, Page J-31

Regarding the schedule for TMDL development, Ohio EPA notes here (and elsewhere in the IR) the uncertainty brought on by the recent Ohio Supreme Court decision, and notes the agency is "evaluating alternatives for addressing both past and future TMDLs." In considering near-term work through the program in particular, it would be helpful to have more clarity on possible approaches the agency is considering to move the program forward and meet the requirements of the Ohio Supreme Court decision. Presumably such a decision should be made before any subsequent TMDLs are submitted to USEPA for approval.

Section J

Finally, concerning prioritization in general, it is not clear to what extent Ohio EPA has considered recent USEPA guidance in developing its prioritization process. For example, the most recent guidance memo from USEPA notes the importance of public engagement in the prioritization process, which can include efforts separate from the public notice process around the IR (U.S. EPA, Memorandum from Benita Best-Wong to Water Division Directors, Regions 1-10, and Robert Maxfield, August 13, 2015, available from https://www.epa.gov/sites/production/files/2015-10/documents/2016-ir-memo-and-cover-memo-8_13_2015.pdf). Ohio EPA should provide more clarity in this section of the report of the extent to which it is following USEPA guidance, including opportunities for public input on the prioritization process.

OHIO FARM BUREAU

FORGING *a* PARTNERSHIP *between* FARMERS *and* CONSUMERS

August 29, 2016

Ohio Environmental Protection Agency
Division of Surface Water
Attn: 303(d) Comments
P.O. Box 1049
Columbus, OH 43216-1049

Re: Draft Ohio 2016 Integrated Water Quality Monitoring and Assessment Report

To Whom It May Concern;

The Ohio Farm Bureau Federation (OFBF) is the largest general farm organization in the state of Ohio with members in all of Ohio's 88 counties. Our members produce virtually every kind of agricultural commodity and as a result, OFBF is strongly interested in Ohio's environmental policies and their potential impact to sustaining a viable agbioresource industry. Our policies are developed via a locally driven grassroots process and support the development of programs, policies and regulations that are scientifically sound, based on credible data, practical, realistic, economically feasible and whenever possible, delivered in a flexible and voluntary manner.

The Draft Ohio 2016 Integrated Water Quality Monitoring and Assessment Report outlines the general condition of Ohio's surface water resources and includes a list of surface waters that do not meet federal or state water quality goals. The report also provides a description of the assessment methodologies used to evaluate each assessment unit for assigned beneficial use designations (human health, recreation, drinking water, and aquatic life).

OFBF would like to submit the following comments based upon a review of the Draft report.

Addressing Nutrients in Lake Erie (Section J3)

OFBF agrees with the assessment and direction the Ohio EPA is undertaking to address the nutrient water quality challenges facing Lake Erie. Lake Erie is a multi-state and binational waterbody requiring a collaborative effort by all parties to develop and implement parallel planning and management efforts. Annex 4 of the Great Lakes Water Quality Agreement provides an effective vehicle for addressing this challenge. Development of Domestic Action Plans, by the four states and one province that share the Lake Erie shoreline, provides the best strategy for improving and protecting Lake Erie.

Evaluating Beneficial Uses: Public Drinking Water Supply (Section H)

Section H of the draft report presents the methodology utilized by Ohio EPA to assess the public drinking water supply (PDWS) beneficial use designation as well as the results of the assessment.

As stated in Section H2.1 - Beneficial Use Designation on page H-3 of the draft document:

> *"The PDWS use designation is defined in paragraph (B)(3) of OAC rule 3745-1-07. It applies to public waters that, with conventional treatment, will be suitable for human intake and meet federal regulations for drinking water."*

280 N. High Street | P.O. Box 182383 | Columbus, OH 43218-2383
Phone: 614.249.2400 | Fax: 614.249.2200 | www.ofbf.org
twitter.com/OhioFarmBureau | facebook.com/OhioFarmBureau

By the above definition, the PDWS use designation clearly relates to the ability of a water utility to produce and distribute safe finished drinking water. It specifically does not address the chemical, biological or physical condition of the raw source water.

Table H-2 (pages H-13 through H-17) of the draft report should only list assessment units that contain public drinking water supplies not meeting federal regulations for finished drinking water. This is not the case. Sixty-two percent (18 of 29) of the assessment units listed on Table H-2 are there solely due to the presence of cyanotoxins in raw water samples. These 18 assessment units should be removed from Table H-2. The presence of a chemical constituent in raw water does not provide the necessary evidence that federal regulations (safe drinking water criteria) were not being met. In addition, Table H-3 (pages H-18 through H-26) must be adjusted to reflect the removal of the 18 assessment units on Table H-2.

I would like to thank you for the opportunity to review and provide comments on the Draft Ohio 2016 Integrated Water Quality Monitoring and Assessment Report. Feel free to contact me, lantosch@ofbf.org, 614-246-8264, if you have any questions.

Sincerely,

Larry M Antosch

Larry M. Antosch, Ph.D.
Senior Director, Policy Development and Environmental Policy

Cc: Frank Burkett, President OFBF, OFBF Board of Trustees, OFBF Cabinet

August 29, 2016

Ohio EPA, Division of Surface Water
P.O. Box 1049
Columbus, Ohio 43216-1049
Attn: 303(d) Comments
via email dsw.webmail@epa.ohio.gov

Dear Sirs and Mesdames:

We appreciate the opportunity to offer comments on the draft Ohio's 2016 Integrated Water Quality Monitoring and Assessment Report[1], which includes the Clean Water Act Section 303(d) list of impaired waters. This comment letter is being written on behalf of the Ohio Corn and Wheat Growers Association (OCWGA) and the Ohio Soybean Association (OSA). Together these organizations represent the interests of over 25,000 farmers from across Ohio, whose work makes a significant economic impact on Ohio's economy and creates thousands of jobs in our state. The focus of these comments is the listing of the nearshore assessment units of the Western Lake Erie Basin (WLEB) on the 303(d) list and the path forward; individual members of our organizations undoubtedly also have concerns about local receiving waters listed in the Report.

Water quality is, and has been, a top priority for Ohio's grain farmers. We are working to better understand the relationship between agricultural practices and impacts on water quality, and to formulate and test what can be done, without bankrupting the farming community, to address the challenges facing Ohio, Indiana, Michigan and Ontario in helping to address harmful algal blooms in Lake Erie. Since 2011, the Ohio Corn Marketing Program (OCMP), the Ohio Small Grains Marketing Program (OSGMP), and the Ohio Soybean Council (OSC) have invested nearly $3.5 million of farmer dollars in research and education to help mitigate nutrient-related problems in Ohio. Please see Attachment A for details on these efforts.

The knowledge of the agricultural community, with all of its technical and economic diversity, has caused us to conclude that, for a number of reasons, a coordinated statewide effort to address nonpoint source nutrient loads into the WLEB, by providing more specificity for the *State of Ohio's Western Lake Erie Basin (WLEB) Collaborative Implementation Plan,* would unquestionably be more productive than pursuing a total maximum daily load (TMDL) through

[1] http://www.epa.ohio.gov/dsw/tmdl/OhioIntegratedReport.aspx#1766910016-report (July 2016)

an impairment listing. We welcome the opportunity to engage in discussions about how these actions and those included in Attachment A can be incorporated into the Statewide Nutrient Reduction Strategy and other initiatives to address nonpoint source loads to the WLEB as an alternative to a TMDL.

We want to express our support to the agency for continuing to allow the binational process, laid out by Annex 4 of the Great Lakes Water Quality Agreement (GLWQA), to fulfill its intended purposes. The binational governance of the GLWQA and the Domestic Action Plans developed as part of Annex 4, would provide the same results as a TMDL, without the additional onerous rulemaking process that would be necessary to develop an Ohio-specific TMDL for Lake Erie. Developing a TMDL is not necessary. Determining the amount of total phosphorus coming from point (including municipal storm sewer systems) and nonpoint sources (including failing septic systems) and what can be done cost-effectively to effectively manage phosphorus loads is vital.

A TMDL will not result in additional federal funding to help address the harmful algal blooms (HABs) in WLEB. The agricultural community is so diverse, with many smaller family farms, that any truly viable solution must include significant federal and/or state funding. Such funding is not part of the TMDL package, and a TMDL typically does not consider affordability, or cost-effectiveness.

If the resources for implementation of WLEB goals are not affordable or otherwise feasible, or sufficiently flexible to account for site-specific conditions or for developing and implementing new technologies, a TMDL will not accomplish anything. Only an implementation strategy that includes funding and flexibility will ultimately achieve the restoration goals. Even if a TMDL for Ohio nonpoint sources contributing to the WLEB were capable of being implemented, the restoration goals for the WLEB will not be achieved unless Michigan and Ontario are in lock step. Implementation of a TMDL without a sound financial strategy could result in significant adverse economic impacts to individual farmers – ultimately resulting in a loss of an important economic sector of Ohio. We are confident that Ohio agriculture can be part of the solution if the cost and effectiveness of technologies are considered as Ohio works to implement the Domestic Action Plans over time.

While we are supportive of Ohio's decision to not list the entire WLEB as impaired, we wish to note several shortcomings in the science used to declare impairments of the Public Drinking Water Supply (PDWS) use designation in Lake Erie and elsewhere, based solely on the concentration of algae. Of course, Ohio must protect the state's drinking water supply. However, the science correlating the amount of algae in raw and finished water is lacking. There is currently no numeric water quality standard for algae in Ohio, and the linkage between the narrative water quality criteria and the Safe Drinking Water Act (SDWA) standards is not demonstrated.

Finished drinking water must meet SDWA standards utilizing conventional drinking water treatment; however, this does not mean that raw (untreated) water must also meet these standards. Numerous drinking water treatment plants have demonstrated that they can safely treat raw water that exceeds the targets used by Ohio EPA in the draft report. It is important to recognize that the microsystin targets for the SDWA are not even maximum criterion limits (MCLs) for finished drinking waters and are instead part of the health advisories in Ohio's harmful algal bloom response strategy[2]. Ohio has not provided a clear relationship between the criterion of two or more excursions above the state drinking water threshold for a health advisory (microcystins = 1 microgram per liter or ug/L) within a 5-year period to establish PDWS impairments (in both 2014 and 2016) and the frequency, duration, and magnitude associated with water quality standards developed as part of the CWA. Applying such a finished drinking water standard to a raw water intake is overly conservative (and therefore potentially costly, and unnecessarily so to affected stakeholders) and does not account for natural variability, or the treatment provided by drinking water facilities. Ohio should collect additional data regarding microcystin levels in raw and finished drinking water, including the ability of drinking water treatment to effectively remove microsystin. Once additional data are collected, we believe that a translator between approved water quality standards and protecting individual water supplies should be developed.

We understand the need to make this process transparent, accountable, and effective and welcome the opportunity to engage in this dialogue to identify solutions that are flexible, maximize cost-effectiveness, and provide meaningful environmental improvements for WLEB. If you have any questions regarding our concerns or would like additional information regarding current efforts being undertaken by our members, please do not hesitate to contact us.

Regards,

Adam Graham

Adam P Graham

President
Ohio Soybean Association

Chad Kemp

Chad Kemp

President
Ohio Corn & Wheat Growers Association

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[2] http://epa.ohio.gov/Portals/28/documents/habs/PWS_HAB_Response_Strategy.pdf

Attachment A

The Ohio Corn Marketing Program (OCMP), the Ohio Small Grains Marketing Program (OSGMP), and the Ohio Soybean Council (OSC) are currently providing significant resources to a number of research initiatives being conducted by The Ohio State University to better understand currently nutrient related conditions in Ohio. These include:

- Participating in edge of field research to revise and validate the Phosphorus Risk Index to identify how phosphorus leaves Ohio fields and how to use the most effective best management practices to limit phosphorus transport.
- Supporting fertilizer placement research
- Funding updates to the Ohio portion of the Tri-State Fertilizer recommendations that are more than twenty years old.
- Providing nutrient management plan (NMP) development assistance to Western Lake Erie Basin (WLEB) farmers
- Revising the Best Management Practices Manual

We also are supporting the 4RTomorrow awareness campaign led by the Ohio Federation of Soil and Water Conservation Districts, to educate Ohio farmers on nutrient stewardship. We support the voluntary 4R Nutrient Stewardship Program's fertilizer retailer certification program led by the Ohio AgriBusiness Association and The Nature Conservancy.

Additionally, our organizations continue to support our members located in the WLEB in their efforts with the Great Lakes Restoration Initiative Demonstration and Nutrient Reduction Projects, the Ohio Clean Lakes Initiative, and their compliance with Ohio Senate Bill 1 and Ohio Senate Bill 150.

From: Harris, Melinda
To: Alexander, Cathy; Babb, Rahel
Subject: FW: Comments and specific questions about 2016 Integrated Water Quality Report
Date: Monday, August 29, 2016 2:41:51 PM
Attachments: image001.png

Melinda Harris
TMDL Supervisor / Rules Coordinator
Division of Surface Water
Ohio Environmental Protection Agency
50 W. Town Street, Suite 700
Columbus, Ohio 43215
(614) 728-1357

From: Annette Shine [mailto:annettedshine@gmail.com]
Sent: Monday, August 29, 2016 2:35 PM
To: EPA dsw.webmail <dsw.webmail@epa.ohio.gov>
Subject: Comments and specific questions about 2016 Integrated Water Quality Report

Dear Division of Surface Water,

Below are my concerns about Ohio's draft document of the 2016 Integrated Water Quality Report which is due to be submitted to the federal EPA. Sadly, the 600 pages do not inspire much confidence in citizens that the Ohio EPA is effectively pursuing its goal "to protect the environment and public health by ensuring compliance with environmental laws and demonstrating leadership in environmental stewardship." Rather, it appears much more proficient at the "active stalling," technique utilized in other countries to thwart implementation of environmental regulations.

I hope you will address my concerns below, in order to revise your draft before submission to the US EPA.

Thanks you very much for your consideration.

Annette D. Shine, Ph.D.
5658 Swan Creek Dr.
Toledo, OH 43614

Questions about Ohio EPA 2016 Integrated Water Quality Report

1. Why has the Western Lake Erie Basin not been listed as impaired due to harmful algae blooms? Your excuse that the watershed is shared with Michigan and Ontario does not absolve

Ohio from addressing this problem, since the nutrients responsible for the HAB come heavily from the Maumee River basin in Ohio. My household alone spent more than $100 to purchase drinking water and sanitizer during the 2014 crisis, and that's not counting the portion of my taxes and utility bill that were utilized by Toledo's water treatment plant.

2. Your 2016 Integrated Water Quality Report contains no fewer than 13 references to the Ohio Supreme Court decision from March 2015 that requires Ohio EPA to follow state requirements in enforcing TMDLs. You primarily cite this Supreme Court ruling as a justification for your further inaction. Chapter 119 consists primarily of procedures and time tables for implementing public notice and allowing public input, including publications and hearings, about proposed rule changes. Since, based on your website, you already appear to have satisfied many of the requirements of Chapter 119 in non-TMDL rules promulgation, what remains to be done to insure that all FUTURE proposed Ohio EPA actions covered by the Supreme Court decision will be in full compliance with Chapter 119? You have had 15 months between when the decision was rendered and when the draft of IR 2016 was published to address these issues.

3. Chapter 119.035 allows you to appoint an advisory committee to help you comply with Chapter 119. Have you appointed such an advisory committee? If so, who are the members, and what has the committee done? If you have not appointed one, why not?

4. Effective January 4, 2016, Ohio EPA has changed standards on E. coli concentrations for recreational water uses. These changes include numerical changes in the bacterial colony count in various use categories, as well as lengthening the time period for "threshold values" from 30 days to 90 days. The time period is extremely significant, since bacterial counts balloon in the warm summer months (June, July and August), which, of course, are the most popular times for water recreation. If you had applied the "new" standards to the data in the 2016 report, instead of the "old" standards, how would the "use attainment" figures reported in Table F-12 be changed? The "old" standards gave 10% supporting and 90% not supporting. This will be important for citizens to assess objectively whether or not water quality is improving.

5. I asked this question during the August 16th webcast about the 2016 IR report, but did not receive an answer. What fraction of the data contained in your report was collected by people or organizations who were NOT employees or contractors of the Ohio EPA? Your metadata published online suggest this is a very small number, on the order of 1%. Your 2014 report indicated an intent to expand the small body of groups eligible to submit "credible" data. The key metric should be the actual percent of outside-contributed data, not the number of groups eligible to submit data.

Anthony Szilagye
155 Maple
Rossford, Ohio 43460

Ohio EPA
Division of Surface Water
PO Box 1049
Columbus, Ohio 43216-1049
dsw.webmail@epa.ohio.gov

Attn. 303d Comments

Dear Sirs:

Having lived in Northwest Ohio most of my life and having witnessed the decline of water quality in Lake Erie, I am submitting the comments below regarding the Ohio 2016 Integrated Water Quality Monitoring and Assessment Report Final Draft (Integrated Report) due to my concern for the limitations of this report regarding Lake Erie.

One of the primary deficits of the report is the lack of advocacy in this report for declaring the Western Basin of Lake Erie Impaired. Ohio has advocated voluntary measures to address the nutrient pollution issue in Lake Erie and other waterbodies in both the Ohio Phosphorus 1 and 2 reports. Voluntary measures have not been successful in reducing nutrient pollution in the Chesapeake and the Fox River Green Bay areas. Both the Chesapeake and Fox River Green Bay watersheds report being successful in reducing nutrient pollution through their having a TMDL to identify the sources and amounts of nutrient pollution. If Ohio is really serious about a healthy Lake Erie the first step in the process is for Ohio to declare the Western Lake Erie Basin Impaired and the Toledo and Oregon intakes be part of this declaration. This declaration will provide the impetus for the TMDL process which will identify the sources and amounts of nutrients affecting Lake Erie.

Once TMDL's are established and sources and amounts Ohio should provide a report to the public to show the reductions in the amounts of pollutants from the various sources. The success of the program can be demonstrated from an accurate accounting of the reduction in pounds of nutrients for investment and changes made.

A critical part of this process is an accurate assessment of nutrient runoff during wet weather conditions. Most of the nutrient pollution occurs to during high flow events and non-point sources need to be accurately assessed. Both the Phosphorus Task Force I and II identify non-point sources as being the primary source of nutrient pollution. 80% of the nutrient pollution comes from wet weather events. So to addressing nutrient pollution without an assessment of nutrient runoff during wet weather events.

Ohio issues advisories for beaches during times of severe algae blooms but has not declared algae/toxins as a recreational contact impairment. Ohio has recreational algae toxin standards and needs to follow through with adding algae/toxin to its recreational contact impairment list.

Lastly, the OEPA should request that the ODA limit manure runoff to the agronomic rate. Currently the agronomic rate for crops for phosphorus is 40 ppm**.** Ohio NPDES permits need to require that all manure applied have a limit of less than 40 ppm. Getting serious of nutrient pollution in Lake Erie will not happen as long as this difference is neglected by Ohio law and regulatory structure.

The advantages for Ohio to do more than just talking the talk of nutrient reduction are numerous. Increased revenue from increased economic activity around Lake Erie is one advantage. Another is for Ohio to adequately address the cause of nutrient pollution that is costing many communities millions of dollars in water treatment upgrades. The costs of addressing this issue will only increase for communities due to the neglect of Ohio in the following years. Addressing is the smart thing to do economically. Assisting Ohio's communities today will assist businesses and communities to flourish and in turn be a boon for the state of Ohio as whole.

Sincerely Your

Anthony Szilagye

From: Patrick Wright
To: EPA dsw.webmail
Subject: Comments on the draft version of the 2016 Integrated Report
Date: Monday, August 29, 2016 1:25:27 PM

Dear Ms. Kavalec et al.,

Ohio will likely learn some valuable information from agriculture trying various best management practices to control nutrient runoff. It would be wonderful if voluntary measures alone would clean up harmful algal blooms. Sadly, that is not how human nature works.

Toledo's improvements in treating both drinking water and sewage/storm water have been the result of enforcement. To improve the entire Maumee River Watershed, TMDLs are needed to establish clear goals and coordinate efforts to meet them. A designation of impairment will bring TMDLs into play as well as bringing more resources to successfully enforce them.

Edge of field monitoring is simple fairness. Pollution gets treated where it is created. For the sake of the common good, please amend and improve your Report to include these realities.

Thank you,
Patrick E. Wright
4326 N. Lockwood Ave.
Toledo, Ohio 43612-1749

Section

E

Evaluating Beneficial Use:
Human Health (Fish Consumption)

E1. Background

The State of Ohio has operated a formal Fish Consumption Advisory (FCA) Program since 1993. Since July 2002, the program's technical and decision-making expertise has been housed at Ohio EPA. The risk assessment protocols used were developed in the early 1990s under the auspices of the Great Lakes Governors Association.

Ohio has adopted human health water quality standards (WQS) criteria to protect the public from adverse impacts, both carcinogenic and non-carcinogenic, due to exposure via drinking water (applicable at public water supply intakes) and to exposure from the contaminated flesh of sport fish (applicable in all surface waters). The latter criterion is called the non-drinking water human health criterion. The purpose of that criterion is to ensure levels of a chemical in water do not bioaccumulate in fish to levels harmful to people who catch and eat the fish. The relationship of the non-drinking water human health criterion to the FCA risk assessment protocols is explained below.

E2. Rationale and Evaluation Method

U.S. EPA's guidance for preparing the 2006 Integrated Report (IR) states:

> *Although the CWA [Clean Water Act] does not explicitly direct the use of fish and shellfish consumption advisories or NSSP [National Shellfish Sanitation Program] classifications to determine attainment of water quality standards, states are required to consider all existing and readily available data and information to identify impaired segments on their section 303(d) lists. For purposes of determining whether a segment is impaired and should be included on a section 303(d) list, EPA considers a fish or shellfish consumption advisory, a NSSP classification, and the supporting data to be existing and readily available data and information that demonstrates non-attainment of a section 101(a) "fishable" use when:*
>
> - *the advisory is based on fish and shellfish tissue data,*
> - *a lower than "Approved" NSSP classification is based on water column and shellfish tissue data (and this is not a precautionary "Prohibited" classification or the state water quality standard does not identify lower than "Approved" as attainment of the standard),*
> - *the data are collected from the specific segment in question, and*
> - *the risk assessment parameters (e.g., toxicity, risk level, exposure duration and consumption rate) of the advisory or classification are cumulatively equal to, or less protective than those in the State's WQS" (U.S. EPA, 2005).*

Ohio's WQS regulations do not describe human consumption of sport fish as an explicit element of aquatic life protection. However, the WQS regulations do include human health criteria that are applicable to all surface waters of the State. Certain of these criteria are derived using assumptions about the bioaccumulation of chemicals in the food chain and the criteria are intended to protect people from adverse health impacts that could arise from consuming fish caught in Ohio's waters. To determine when and how waters should be listed as impaired because of FCAs, the risk assessment parameters on which the human health WQS criteria are based were compared with those used in the Ohio FCA program. If the State has issued an advisory for a specific water body and that advisory is equal to or less protective than the State's WQS, then one can assume there is an exceedance of the

WQS. On the other hand, if the advisory is more protective than the WQS, one cannot assume that the issuance of the advisory indicates an exceedance of the WQS. Figure E-1 illustrates this point.

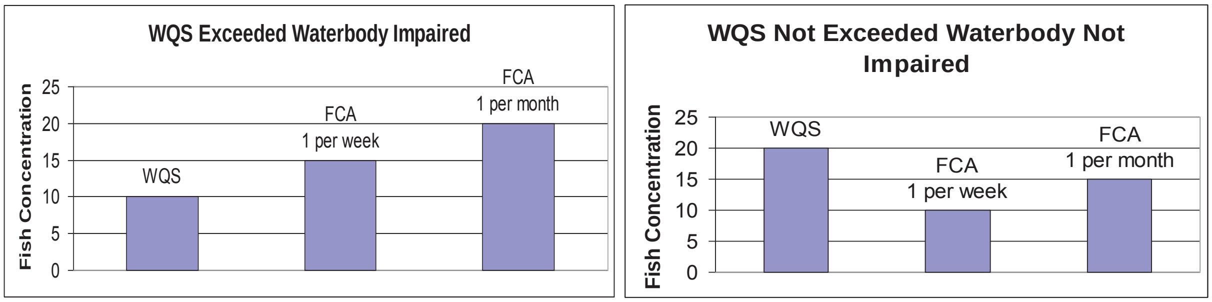


Figure E-1. Illustration of the relationship among the WQS values, the values that trigger issuance of FCAs and the resulting decision regarding water body impairment associated with an FCA.

A fish consumption advisory is determined based on the quantity of a chemical in fish, such as micrograms of chemical per kilogram of fish tissue (µg/kg). WQS, on the other hand, are expressed as the quantity of chemical in water, such as micrograms of chemical per liter of water (µg/L). The information used to calculate the human health non-drinking WQS criterion can be used to calculate a maximum safe fish concentration. The fish concentration value can then be directly compared to the FCA program values to determine whether the advisory is less or more protective than the WQS criterion. The values in Table E-1 make this comparison for chemicals for which there are both an FCA and an Ohio human health non-drinking water criterion. Because Ohio human health criteria differ between the Lake Erie and Ohio River basins, separate comparisons are presented.

These constituents shown in Table E-1 were chosen based on U.S. EPA's recommendations on page 53 of its 2006 IR Guidance (http://www.epa.gov/sites/production/files/2015-10/documents/2006irg-report.pdf; U.S. EPA, 2006a). Hexachlorobenzene and mirex were added because of historic fish tissue contamination with those contaminants.

The table demonstrates that the levels of fish tissue contaminants that trigger a fish advisory have little obvious relation to the levels of fish tissue contaminants on which the WQS criteria are based. This discrepancy exists because different assumptions about fish consumption rates are made in calculating water quality standards than in issuing fish advisories. For example, the fish consumption rate used to calculate the Ohio River Basin WQS criteria is 17.5 grams per day. The fish consumption rate used to calculate a “one meal per week” advisory recommendation is 32.6 grams per day. These values are not the same because the WQS criteria fish consumption rates are based on nutritional studies that attempt to capture approximately how much sport caught fish people are eating, whereas the fish consumption advisory rates are meant to advise people how much fish they can safely consume.

Table E-1. Comparison between fish concentration values and FCA program values.

Basin / Parameter	Fish concentration on which the WQS is based[1]	Range of fish concentrations triggering an "eat no more than one meal per week" advisory	Range of fish concentrations triggering an "eat no more than one meal per month" advisory
Lake Erie / PCB	23 µg/kg	50 - 220 µg/kg	221 - 1,000 µg/kg
Ohio River / PCB	54 µg/kg	50 - 220 µg/kg	221 - 1,000 µg/kg
Lake Erie / mercury	350 µg/kg	110 - 220 µg/kg	221 - 1,000 µg/kg
Ohio River / mercury	1,000 µg/kg	110 - 220 µg/kg	221 - 1,000 µg/kg
Lake Erie / DDT	140 µg/kg	500 - 2,188 µg/kg	2,189 – 9,459 µg/kg
Ohio River / DDT	320 µg/kg	500 - 2,188 µg/kg	2,189 – 9,459 µg/kg
Lake Erie / Chlordane	130 µg/kg	500 - 2,188 µg/kg	2,189 – 9,459 µg/kg
Ohio River / Chlordane	310 µg/kg	500 - 2,188 µg/kg	2,189 – 9,459 µg/kg
Lake Erie / Hexachlorobenzene	29 µg/kg	800 - 3,499 µg/kg	3,500 - 15,099 µg/kg
Ohio River / hexachlorobenzene	67 µg/kg	800 - 3,499 µg/kg	3,500 - 15,099 µg/kg
Lake Erie/ mirex	88 µg/kg	200 - 874 µg/kg	875 - 3,783 µg/kg
Ohio River/ mirex	200 µg/kg	200 - 874 µg/kg	875 - 3,783 µg/kg

Values	Advisory is less protective than the WQS criterion, WQS exceeded, water body impaired
Values	Advisory is more protective than WQS criterion, WQS not exceeded, no impairment from FCA
Values	Advisory may be more, or less, protective than WQS criterion

U.S. EPA stipulates that the risk assessment parameters used to categorize fish tissue contaminant data must be at least as protective as those used in the WQS-based fish concentrations. Fish advisory contaminant levels are not directly related to the WQS criteria contaminant levels and in some cases are not as protective. Therefore, Ohio EPA has elected to directly compare fish tissue data with the WQS criteria calculations shown in the above table, instead of using advisory-based categorizations.

The following steps were utilized to determine a 303(d) list category for waters based on fish tissue contaminant data:

Step 1: Determine available data

All data in the fish tissue database were evaluated for the 2016 IR. The most recent 10 years of data collections, 2005-2014, were used for making category 1 and category 5 determinations. In cases where multiple years of data were available in that 10-year window, all data were weighted equally. In cases where the only data available were older than 2005, the category determined by those data became historical (i.e., impaired-historical or unimpaired-historical).

[1] See Section E4 for an explanation of how these concentrations were calculated.

Ohio's Credible Data Law states that all data greater than five years in age will be considered historical and that it can be used as long as the director has identified compelling reasons as to why the data are credible. In the case of fish tissue, the use of data older than five but ten or fewer years old is necessary. This is because not enough fish tissue samples are gathered from enough locations each year to conduct a thorough assessment of contaminant levels in fish tissue across the state. Frequently, multiple sampling years are needed to make a determination about issuing or rescinding an advisory. Owing to limited staff time and budget resources, it sometimes takes over five years to revisit a location and collect more fish tissue samples. A more complete picture of contaminants in fish tissue is presented when data are utilized that reach back 10 years.

Step 2: Determine fish tissue contaminant concentrations

For streams in each assessment unit (AU)[2], a weighted average based on species and trophic level was calculated for each contaminant. One year of data was considered adequate to categorize the fish as impaired or unimpaired. Inland lakes are considered a component of the assessment unit(s) in which they are geographically located, so sample results may affect the assessment status of the AU(s) and the index scores for the AU(s). Inland lakes are also analyzed individually; results are displayed in Table E-12.

Step 3: Determine adequate species data

In order to assess an AU as category 1 or 5, at least four samples from that AU are needed, with at least two samples from each of trophic levels three and four. An exception was made for AUs with 10 or more samples from one trophic level and only one sample from the other trophic level.

A geometric mean was calculated for each species and then a weighted average was calculated for each trophic level. A weighted average for each AU was then calculated using the consumption rates found in the water quality criteria calculations. That weighted average was then compared against the contaminant levels listed in Table E-1 and categorized as category 1 or 5.

In cases where those data requirements were not met, an AU was classified as category 3i. In cases where no data were available, an AU was classified as category 3.

This calculation methodology is derived from the methodology described in Section 4.3.2 of the document Guidance for Implementing the January 2001 Methylmercury Water Quality Criterion, Final, U.S. EPA Office of Science and Technology, EPA-823-R-09-002, January 2009 (http://www.epa.gov/waterscience/criteria/methylmercury/pdf/guidance-final.pdf).

For the Lake Erie Basin:

$$C_{avgLEB} = \frac{3.6 * C_3 + 11.4 * C_4}{15} = 0.27\ mg/kg$$

[2] Assessment units include both watershed assessment units (12-digit hydrologic units) and large river assessment units (generally rivers that drain more than 500 square miles).

For the Ohio River Basin:

$$C_{avgORB} = \frac{11.8 * C_3 + 5.7 * C_4}{17.5} = 0.18\ mg/kg$$

Where:

C_3 = average concentration for trophic level 3
C_4 = average concentration for trophic level 4

Table E-2. Example data for calculating a weighted average fish tissue value.

Species	Trophic Level	Number of Samples	Geometric mean mercury concentration (mg/kg)
Black crappie (*Pomoxis nigromaculatus*)	3	1	0.085
Bluegill sunfish (*Lepomis macrochirus*)	3	2	0.098
Channel catfish (*Ictalurus punctatus*)	3	2	0.145
Common carp (*Cyprinus carpio*)	3	3	0.120
Largemouth bass (*Micropterus salmoides*)	4	3	0.212
Smallmouth bass (*Micropterus dolomieu*)	4	1	0.421
Spotted bass (*Micropterus punctulatus*)	4	1	0.347

Step 4: Determine appropriate assessment unit divisions

It should be recognized that in determining impairment status based on AUs instead of individual water bodies, extrapolations to water bodies without data are made. In some cases, water bodies that have no data will be categorized as impaired if they are within an impaired AU.

Inland lakes are treated as individual water bodies for impairment purposes regardless of whether they are entirely contained within an AU or straddle more than one AU and results for individual lakes are shown in Table E-12. In addition, any AU containing all or part of an impaired inland lake was considered to be not supporting the beneficial use (see Step 2 above for further explanation).

Step 5: Categorize water bodies within assessment units

Category 5 – Impaired
Any AU meeting the data requirements in step 3 with a weighted average fish tissue concentration of PCBs, mercury, DDT, chlordane, or hexachlorobenzene above the WQS-based fish tissue concentration is placed into category 5. When the data indicating impairment are older than 10 years, the AU remains impaired but is considered impaired-historical, category 5h[3].

[3] An "h" subcategory could indicate one of two possibilities. In IRs prior to 2010, when Ohio reported on the larger assessment units, categories were assigned based on data collected anywhere in that unit. For the 2010 analysis, the 2008 category was assigned to each of the new, smaller units. If the original data were collected before 1999,

Category 1 – Not Impaired

To be categorized as category 1, not impaired, an AU must meet the data requirements in step 3 and the weighted average concentration of a contaminant must be below the threshold that would trigger an impairment. AUs that had previously been considered category 1, but with no data since 2005, were reclassified as Category 1h[2].

Category 3 – Insufficient or No Data

Any AU in which current data are available but those data are insufficient according to step 3 (to categorize the AU as category 1 or 5), the AU was listed as category 3i. If no data were available for an AU, the category was listed as 3. If an AU had previously been classified as category 3 or 3i and there were no data in the AU since 2005, the AU was classified as category 3.

Please see Figure E-2 for a summary of the procedure detailed previously.

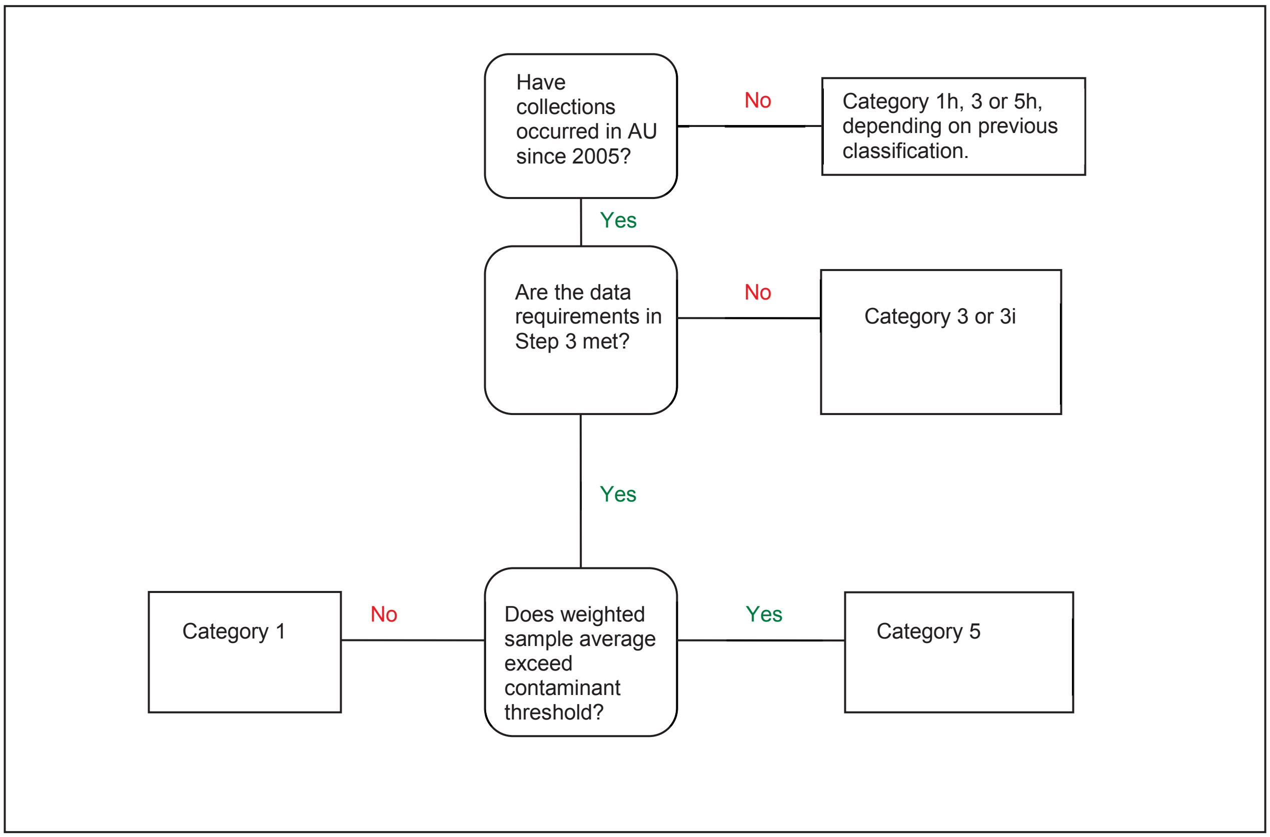


Figure E-2. Flow chart for the categorization of fish tissue data for the IR.

a re-analysis of the data could not be completed for the 2010 report, so the smaller units retained the category of the larger unit. In some cases, the data were collected within the smaller assessment unit and in other cases they were not. For the older data, a distinction between the two could not be made for this report. In addition, data collected prior to 2005 are considered historical in the 2016 analysis.

E3. Results

Fish tissue data for six contaminants were reviewed to determine an IR attainment status. The methodology for selecting, reviewing and categorizing fish tissue data is given in Section E2. The six contaminants reviewed were mercury, PCBs, chlordane, DDT, mirex and hexachlorobenzene. These contaminants were chosen for review based on current and recent fish consumption advisories in Ohio caused by these contaminants, as well as existing human health WQS criteria for the six contaminants.

There were a total of 152 changes to the human health attainment statuses of assessment units for the 2016 IR which are summarized in Table E-3. The primary reasons for change in status include data having become historical and the collection and analysis of new information.

Table E-3. A summary of changes in attainment status from 2014 to 2016 IR.

Reason for change		Changes
Data have become historical		**29**
	Category 1 to 1h	*12*
	Category 3i to 3	*11*
	Category 5 to 5h	*6*
New data		**123**
	Became category 1	*63*
	Became category 3i	*31*
	Became category 5	*29*
Total changes		**152**

Detailed results are presented in Tables E-4 through E-12. Detailed information on specific fish consumption advisories including geographic extent of the advisory, type and size of fish affected and consumption advice can be found at http://www.epa.ohio.gov/dsw/fishadvisory/index.aspx.

Table E-4 lists waters impaired because fish tissue levels of PCBs or mercury exceed the threshold level upon which the WQS criterion is based, while Table E-5 includes those not impaired. Table E-6 lists water bodies identified as impaired for this use on a previous 303(d) list that are no longer considered impaired, either because of new data or the updated methodology described in Section E1. There are three WAUs in Ohio with significant pollution resulting in 303(d) listings from other contaminants that affect fish tissue, as shown in Table E-7. Remediation activities on most of these water bodies are underway. In Tables E-8 and E-9, the data for all these locations have become historical and new data would need to be collected before a current impairment status can be determined. Since age of data alone is not a reason for delisting, the water bodies in Table E-9 remain on the 303(d) list. Table E-10 lists waters with current fish tissue data where inadequate samples exist to determine level of impairment. Sites in Table E-10 have never had sufficient data for assessment, now or in the past. Table E-11 lists large rivers and their impairment status. Table E-12 lists inland lake impairment status.

Table E-4. Waters not supporting the human health use because levels of PCBs or mercury in fish tissue exceed the threshold level upon which the WQS criterion is based. These waters are category 5.

Water Body (Category 5: Impaired)	Assessment Unit	Pollutant
Heldman Ditch-Ottawa River	04100001 03 07	PCBs
Sibley Creek-Ottawa River	04100001 03 08	PCBs
West Branch St Joseph River	04100003 02 04	PCBs
Cogswell Cemetery-St Joseph River	04100003 03 02	PCBs
Willow Run-St Joseph River	04100003 05 05	PCBs, Mercury
Prairie Creek-St Marys River	04100004 02 05	PCBs
Flat Run-Tiffin River	04100006 03 03	Mercury
Village of Stryker-Tiffin River	04100006 05 03	PCBs
Sixmile Creek-Auglaize River	04100007 02 04	PCBs
Lima Reservoir-Ottawa River	04100007 03 06	PCBs
Dog Creek	04100007 08 01	PCBs
Lower Town Creek	04100007 08 04	PCBs
Big Run-Flatrock Creek	04100007 12 06	PCBs
Howard Run-Blanchard River	04100008 03 04	PCBs
Heilman Ditch-Swan Creek	04100009 08 04	PCBs
Rhodes Ditch-South Branch Portage River	04100010 02 04	PCBs
North Branch Portage River	04100010 03 01	PCBs
Portage River	04100010 05 02	PCBs
Lower Toussaint Creek	04100010 06 03	PCBs
Town of Lindsey-Muddy Creek	04100011 14 04	PCBs
Huron River-Frontal Lake Erie	04100012 06 06	PCBs
Baker Creek-West Branch Rocky River	04110001 01 08	PCBs
Rocky River	04110001 02 03	PCBs
Jackson Ditch-East Branch Black River	04110001 04 04	Mercury
Lower West Branch Black River	04110001 05 06	PCBs
Black River	04110001 06 02	PCBs
Ladue Reservoir-Bridge Creek	04110002 01 04	PCBs
Lake Rockwell-Cuyahoga River	04110002 02 03	PCBs
Wingfoot Lake outlet-Little Cuyahoga River	04110002 03 03	PCBs
Fish Creek-Cuyahoga River	04110002 03 05	PCBs
Boston Run-Cuyahoga River	04110002 04 05	PCBs
Lower Ashtabula River	04110003 01 05	PCBs
Griswold Creek-Chagrin River	04110003 04 02	PCBs, DDT
Town of Jefferson-Mill Creek	04110004 04 03	Mercury
Headwaters Middle Fork Little Beaver Creek	05030101 04 02	Mirex
Elk Run-Middle Fork Little Beaver Creek	05030101 04 05	PCBs
Long Run-Yellow Creek	05030101 07 04	PCBs
Hollow Rock Run-Yellow Creek	05030101 08 04	PCBs

Water Body (Category 5: Impaired)	Assessment Unit	Pollutant
Lower Cross Creek	05030101 10 05	PCBs
Fish Creek-Mahoning River	05030103 01 03	PCBs
Deer Creek	05030103 02 01	PCBs
Island Creek-Mahoning River	05030103 02 04	PCBs
Kirwin Reservoir-West Branch Mahoning River	05030103 03 04	PCBs
Charley Run Creek-Mahoning River	05030103 03 06	PCBs
Lower Mosquito Creek	05030103 05 03	PCBs
Lower Meander Creek	05030103 07 03	PCBs
Dry Fork-Short Creek	05030106 02 07	PCBs
Cox Run-Wheeling Creek	05030106 03 03	PCBs
Lower McMahon Creek	05030106 07 04	PCBs
Pea Vine Creek-Captina Creek	05030106 09 05	PCBs
Eightmile Creek-Little Muskingum River	05030201 07 05	PCBs
Sugar Creek-Duck Creek	05030201 09 04	PCBs
Portage Lakes-Tuscarawas River	05040001 01 05	PCBs
Headwaters Sandy Creek	05040001 04 06	PCBs
Armstrong Run-Sandy Creek	05040001 06 05	PCBs
Beal Run-Sandy Creek	05040001 06 07	PCBs, Hexachlorobenzene
Headwaters Clear Fork Mohican River	05040002 03 01	PCBs
Switzer Creek-Clear Fork Mohican River	05040002 04 05	PCBs
Dillon Lake-Licking River	05040006 06 03	PCBs
Dudley Run-Rush Creek	05060001 02 03	PCBs
Greenbrier Creek-Big Darby Creek	05060001 22 03	PCBs
Lizard Run-Big Darby Creek	05060001 22 04	PCBs
Deer Creek Lake-Deer Creek	05060002 02 05	PCBs
Scippo Creek	05060002 04 05	PCBs
Sour Run-Little Salt Creek	05060002 08 05	PCBs
Poe Run-Salt Creek	05060002 09 06	PCBs
Pee Pee Creek	05060002 11 04	PCBs
Leeth Creek-Sunfish Creek	05060002 12 06	PCBs
Big Run-Scioto River	05060002 16 02	PCBs
Dividing Branch-Greenville Creek	05080001 11 03	PCBs
Beals Run-Indian Creek	05080002 08 03	PCBs
Ice Creek	05090103 01 03	PCBs
Storms Creek	05090103 01 04	PCBs
Wards Run-Little Scioto River	05090103 06 05	PCBs
Soldiers Run-Ohio Brush Creek	05090201 05 06	PCBs
Newman Run-Little Miami River	05090202 05 04	PCBs
West Fork-Mill Creek	05090203 01 05	PCBs
Grand Lake-St Marys	05120101 02 04	PCBs

Table E-5. Waters fully supporting the human health use because fish tissue levels of PCBs or mercury are below the threshold level upon which the WQS criterion is based. These waters are category 1.

Water Body (Category 1: Unimpaired)	Assessment Unit
Headwaters Tenmile Creek	04100001 03 04
Clear Fork-East Branch St Joseph River	04100003 01 06
Nettle Creek	04100003 03 01
Fourmile Creek-St Marys River	04100004 01 06
Yankee Run-St Marys River	04100004 03 03
Town of Willshire-St Marys River	04100004 03 05
Bates Creek-Tiffin River	04100006 03 01
Village of Buckland-Auglaize River[4]	04100007 02 02
Sims Run-Auglaize River	04100007 02 03
Lost Creek	04100007 03 05
Wolf Ditch-Little Auglaize River	04100007 06 03
Dry Fork-Little Auglaize River	04100007 06 04
West Branch Prairie Creek	04100007 07 02
Prairie Creek	04100007 07 03
Burt Lake-Little Auglaize River	04100007 08 06
Big Run-Auglaize River	04100007 09 04
City of Findlay Riverside Park-Blanchard River	04100008 02 05
East Branch Portage River	04100010 02 02
Green Creek	04100011 12 03
City of Medina-West Branch Rocky River	04110001 01 05
Cossett Creek-West Branch Rocky River	04110001 01 06
Headwaters East Branch Rocky River	04110001 02 01
Baldwin Creek-East Branch Rocky River	04110001 02 02
Town of Litchfield-East Branch Black River	04110001 04 01
Salt Creek-East Branch Black River	04110001 04 02
Wellington Creek	04110001 05 03
East Branch Reservoir-East Branch Cuyahoga River	04110002 01 01
Mogadore Reservoir-Little Cuyahoga River	04110002 03 02
Peters Creek-Mill Creek	04110004 04 02
Town Fork	05030101 08 01
McIntyre Creek	05030101 10 04
Hardin Run-Ohio River	05030101 11 06
Pymatuning Reservoir	05030102 01 05
Booth Run-Pymatuning Creek	05030102 03 04
Town of Newton Falls-West Branch Mahoning River	05030103 03 05
Mouth Eagle Creek	05030103 04 05
Middle Mosquito Creek	05030103 05 02

[4] Shaded rows indicate WAUs that would be impaired if the U.S. EPA mercury criterion of 0.3 mg/kg were effective.

Water Body (Category 1: Unimpaired)	Assessment Unit
Andersons Run-Mill Creek	05030103 08 03
North Fork Captina Creek	05030106 09 01
South Fork Captina Creek	05030106 09 02
Forked Run-Ohio River	05030202 04 04
West Creek-Ohio River	05030202 08 04
Center Branch	05030204 01 01
Turkey Run-Rush Creek	05030204 02 04
East Branch Sunday Creek	05030204 07 01
Willow Creek-Hocking River	05030204 10 01
Nimisila Reservoir-Nimisila Creek	05040001 03 02
Buttermilk Creek-Stillwater Creek	05040001 13 04
Brushy Fork	05040001 14 02
Craborchard Creek-Stillwater Creek	05040001 14 03
Upper Little Stillwater Creek	05040001 15 03
Weaver Run-Stillwater Creek	05040001 16 03
Headwaters North Branch Kokosing River	05040003 01 01
Little Jelloway Creek	05040003 04 01
Brush Run-Kokosing River	05040003 04 03
Big Run-Killbuck Creek	05040003 08 04
Bucklew Run-Killbuck Creek	05040003 08 05
Reasoners Run-Olive Green Creek	05040004 11 04
Trail Run-Wills Creek	05040005 02 07
Beeham Run-Salt Fork	05040005 04 06
Wolf Run-Wills Creek	05040005 05 08
Twomile Run-Wills Creek	05040005 06 02
Wills Creek Dam-Wills Creek	05040005 06 04
Mouth Wills Creek	05040005 06 05
Buckeye Lake	05040006 04 03
Rocky Fork	05040006 05 03
Gander Run-Scioto River	05060001 04 01
Town of La Rue-Scioto River	05060001 04 05
Lower Mill Creek	05060001 06 04
O'Shaughnessy Dam-Scioto River	05060001 12 02
Hayden Run-Scioto River	05060001 12 04
Hoover Reservoir-Big Walnut Creek	05060001 13 08
Alum Creek Dam-Alum Creek	05060001 14 04
Town of Carroll-Walnut Creek	05060001 17 05
Big Run-Walnut Creek	05060001 18 05
Spain Creek-Big Darby Creek	05060001 19 02
Robinson Run-Big Darby Creek	05060001 19 05

Water Body (Category 1: Unimpaired)	Assessment Unit
Barron Creek-Little Darby Creek	05060001 20 05
Thomas Ditch-Little Darby Creek	05060001 20 06
Worthington Ditch-Big Darby Creek	05060001 21 01
Silver Ditch-Big Darby Creek	05060001 21 02
Richmond Ditch-Deer Creek	05060002 01 02
Turkey Run-Deer Creek	05060002 01 06
Town of Mount Sterling-Deer Creek	05060002 02 04
Blue Creek-Salt Creek	05060002 06 05
Stony Creek-Scioto River	05060002 10 05
Headwaters Morgan Fork	05060002 12 02
Little Beaver Creek-Big Beaver Creek	05060002 13 03
Town of Washington Court House-Paint Creek	05060003 01 03
Cliff Creek-Paint Creek	05060003 06 03
Mud Run-North Fork Paint Creek	05060003 08 05
Indian Lake-Great Miami River	05080001 01 03
Stoney Creek	05080001 04 03
Lake Loramie-Loramie Creek	05080001 05 03
Mosquito Creek	05080001 07 02
Garbry Creek-Great Miami River	05080001 07 05
Headwaters Greenville Creek	05080001 10 04
Bridge Creek-Greenville Creek	05080001 11 02
Town of Covington-Stillwater River	05080001 12 05
Clarence J Brown Lake-Buck Creek	05080001 17 05
Dry Run-Wolf Creek	05080002 01 03
Rush Run-Sevenmile Creek	05080002 05 04
Ninemile Creek-Sevenmile Creek	05080002 05 05
Cotton Run-Four Mile Creek	05080002 06 05
Camp Creek-Symmes Creek	05090101 09 03
Pigeon Creek-Symmes Creek	05090101 10 03
Aaron Creek-Symmes Creek	05090101 10 04
Howard Run-Pine Creek	05090103 02 04
Lick Run-Pine Creek	05090103 02 05
McDowell Creek-Little Scioto River	05090103 05 04
McConnel Creek-Rocky Fork	05090103 06 03
Headwaters Turkey Creek	05090201 02 01
Little East Fork-Ohio Brush Creek	05090201 05 01
Lick Fork	05090201 05 02
Middle Caesar Creek	05090202 04 04
Lower Caesar Creek	05090202 04 06
Headwaters Cowan Creek	05090202 06 04

Water Body (Category 1: Unimpaired)	Assessment Unit
Wilson Creek-Cowan Creek	05090202 06 05
Headwaters East Fork Little Miami River	05090202 10 02
Todd Run-East Fork Little Miami River	05090202 11 03
Lucy Run-East Fork Little Miami River	05090202 12 03
Headwaters Stonelick Creek	05090202 13 01
Lick Fork-Stonelick Creek	05090202 13 04
Salt Run-East Fork Little Miami River	05090202 13 05

Table E-6. Waters fully supporting the human health use because fish tissue levels of PCBs or mercury are below the threshold level upon which the WQS criterion is based and which were categorized as impaired in the 2014 IR. These waters have become category 1 with the current assessment.

Water Body (Newly Unimpaired for 2016)	Assessment Unit	Reason for delisting
Headwaters Tenmile Creek	04100001 03 04	New Data
Yankee Run-St Marys River	04100004 03 03	New Data
Bates Creek-Tiffin River	04100006 03 01	New Data
East Branch Portage River	04100010 02 02	New Data
City of Medina-West Branch Rocky River	04110001 01 05	New Data
Headwaters East Branch Rocky River	04110001 02 01	New Data
Baldwin Creek-East Branch Rocky River	04110001 02 02	New Data
Town of Litchfield-East Branch Black River	04110001 04 01	New Data
Salt Creek-East Branch Black River	04110001 04 02	New Data
Town Fork	05030101 08 01	New Data
McIntyre Creek	05030101 10 04	New Data
Town of Newton Falls-West Branch Mahoning River	05030103 03 05	New Data
Mouth Eagle Creek	05030103 04 05	New Data
Spain Creek-Big Darby Creek	05060001 19 02	New Data
Robinson Run-Big Darby Creek	05060001 19 05	New Data

Table E-7. Waters with contaminants other than PCBs and mercury that affect fish tissue (included on the 303(d) list). These waters are category 5.

Water Body (Impaired by Other Pollutants)	Assessment Unit	Pollutant
Griswold Creek-Chagrin River	04110003 04 02	DDTs
Beal Run-Sandy Creek	05040001 06 07	Hexachlorobenzene
Headwaters Middle Fork Little Beaver Creek	05030101 04 02	Mirex

Table E-8. Waters for which the existing unimpaired status cannot be confirmed because data have become historical and not enough new data are available. These waters are category 1h.

Water Body (Category 1h: Unimpaired, Historic Data)	Assessment Unit
Mud Creek	04100006 06 02
Lower Bad Creek	04100009 03 02
Mouth Tymochtee Creek	04100011 06 05
Little Sandusky River	04100011 07 01
Norwalk Creek	04100012 06 03
Coon Creek-East Branch Black River	04110001 03 03
Charlemont Creek	04110001 05 01
Sawyer Brook-Cuyahoga River	04110002 01 06
Mud Brook	04110002 04 01
Middle Ashtabula River	04110003 01 04
Middle Rock Creek	04110004 02 02
Griggs Creek	04110004 04 01
Bronson Creek-Grand River	04110004 05 02
Little Yellow Creek	05030101 11 02
Carpenter Run-Ohio River	05030101 11 03
Headwaters West Fork Duck Creek	05030201 09 01
Groundhog Creek-Ohio River	05030202 08 02
Oldtown Creek-Ohio River	05030202 08 03
Broad Run-Ohio River	05030202 08 05
Headwaters Hocking River	05030204 04 01
Clear Fork	05030204 06 01
Fourmile Creek	05030204 10 03
Seymour Run-Black Fork	05040002 02 02
East Branch Kokosing River	05040003 01 02
Jug Run-Wakatomika Creek	05040004 01 04
Town of Frazeysburg-Wakatomika Creek	05040004 02 04
Bacon Run	05040005 06 01
White Eyes Creek	05040005 06 03
Big Run	05040006 06 02
Headwaters Olentangy River	05060001 08 01
Headwaters Whetstone Creek	05060001 09 02
Claypool Run-Whetstone Creek	05060001 09 03
Beaver Run-Olentangy River	05060001 10 03
Brandige Run-Olentangy River	05060001 10 05
Indian Run-Olentangy River	05060001 10 06
Delaware Run-Olentangy River	05060001 10 07
Deep Run-Olentangy River	05060001 11 01
Rush Run-Olentangy River	05060001 11 02

Water Body (Category 1h: Unimpaired, Historic Data)	Assessment Unit
Mouth Olentangy River	05060001 11 03
West Branch Alum Creek	05060001 14 01
Headwaters Alum Creek	05060001 14 02
Big Run-Alum Creek	05060001 14 03
Headwaters Walnut Creek	05060001 17 02
Hellbranch Run	05060001 22 01
South Fork Rocky Fork	05060003 05 01
Clear Creek	05060003 05 02
Headwaters Rocky Fork	05060003 05 03
Rocky Fork Lake-Rocky Fork	05060003 05 04
Franklin Branch-Rocky Fork	05060003 05 05
North Fork Great Miami River	05080001 01 01
South Fork Great Miami River	05080001 01 02
South Fork Stillwater River	05080001 09 01
Headwaters Stillwater River	05080001 09 02
North Fork Stillwater River	05080001 09 03
Boyd Creek	05080001 09 04
Woodington Run-Stillwater River	05080001 09 05
Town of Beamsville-Stillwater River	05080001 09 06
Indian Creek	05080001 12 01
Swamp Creek	05080001 12 02
Trotters Creek	05080001 12 03
Harris Creek	05080001 12 04
Lesley Run-Twin Creek	05080002 02 05
Town of Gratis-Twin Creek	05080002 03 04
Town of Germantown-Twin Creek	05080002 03 06
Headwaters Sevenmile Creek	05080002 05 01
Paint Creek	05080002 05 02
Beasley Run-Sevenmile Creek	05080002 05 03
Headwaters Four Mile Creek	05080002 06 01
Little Four Mile Creek	05080002 06 02
East Fork Four Mile Creek-Four Mile Creek	05080002 06 03
Acton Lake Dam-Four Mile Creek	05080002 06 04
Town of Zaleski-Raccoon Creek	05090101 02 05
Headwaters Little Raccoon Creek	05090101 04 01
Bundle Run-Ohio Brush Creek	05090201 05 03
North Branch Caesar Creek	05090202 04 01
Upper Caesar Creek	05090202 04 02
South Branch Caesar Creek	05090202 04 03
Flat Fork	05090202 04 05

Water Body (Category 1h: Unimpaired, Historic Data)	Assessment Unit
Dutch Creek	05090202 06 01
Headwaters Todd Fork	05090202 06 02
Lytle Creek	05090202 06 03
Little Creek-Todd Fork	05090202 06 06
Turtle Creek	05090202 10 01
Headwaters Dodson Creek	05090202 10 03
Anthony Run-Dodson Creek	05090202 10 04
West Fork East Fork Little Miami River	05090202 10 05
Glady Creek-East Fork Little Miami River	05090202 10 06
Solomon Run-East Fork Little Miami River	05090202 11 01
Fivemile Creek-East Fork Little Miami River	05090202 11 02
Poplar Creek	05090202 12 01
Cloverlick Creek	05090202 12 02
Backbone Creek-East Fork Little Miami River	05090202 12 04
Brushy Fork	05090202 13 02
Moores Fork-Stonelick Creek	05090202 13 03

Table E-9. Waters for which the existing impaired status cannot be confirmed because data have become historical and not enough new data are available. These waters are category 5h.
Note: The waters remain on the 303(d) list.

Water Body (Category 5h: Impaired, Historic Data)	Assessment Unit
Shantee Creek	04100001 03 01
Halfway Creek	04100001 03 02
Prairie Ditch	04100001 03 03
North Tenmile Creek	04100001 03 05
Tenmile Creek	04100001 03 06
Eagle Creek	04100003 03 03
Village of Montpelier-St Joseph River	04100003 03 04
Bear Creek	04100003 03 05
West Buffalo Cemetery-St Joseph River	04100003 03 06
Bluff Run-St Joseph River	04100003 05 01
Big Run	04100003 05 02
Russell Run-St Joseph River	04100003 05 03
Sol Shank Ditch-St Joseph River	04100003 05 06
Muddy Creek	04100004 01 01
Center Branch St Marys River	04100004 01 02
East Branch St Marys River	04100004 01 03
Kopp Creek	04100004 01 04
Sixmile Creek	04100004 01 05
Hussey Creek	04100004 02 01

Water Body (Category 5h: Impaired, Historic Data)	Assessment Unit
Eightmile Creek	04100004 02 02
Blierdofer Ditch	04100004 02 03
Twelvemile Creek	04100004 02 04
Little Black Creek	04100004 03 01
Black Creek	04100004 03 02
Duck Creek	04100004 03 04
Leatherwood Creek	04100006 03 02
Beaver Creek	04100006 05 01
Brush Creek	04100006 05 02
Buckskin Creek-Tiffin River	04100006 06 04
Headwaters Auglaize River	04100007 01 01
Blackhoof Creek	04100007 01 02
Wrestle Creek-Auglaize River	04100007 01 03
Pusheta Creek	04100007 01 04
Two Mile Creek	04100007 02 01
Upper Hog Creek	04100007 03 01
Middle Hog Creek	04100007 03 02
Little Hog Creek	04100007 03 03
Lower Hog Creek	04100007 03 04
Little Ottawa River	04100007 04 01
Dug Run-Ottawa River	04100007 04 02
Honey Run	04100007 04 03
Pike Run	04100007 04 04
Leatherwood Ditch	04100007 04 05
Beaver Run-Ottawa River	04100007 04 06
Sugar Creek	04100007 05 01
Plum Creek	04100007 05 02
Village of Kalida-Ottawa River	04100007 05 03
Upper Jennings Creek	04100007 09 01
West Jennings Creek	04100007 09 02
Lower Jennings Creek	04100007 09 03
Prairie Creek	04100007 09 06
Cessna Creek	04100008 01 01
Headwaters Blanchard River	04100008 01 02
The Outlet-Blanchard River	04100008 01 03
Potato Run	04100008 01 04
Ripley Run-Blanchard River	04100008 01 05
Brights Ditch	04100008 02 01
The Outlet	04100008 02 02
Findlay Upground Reservoirs-Blanchard River	04100008 02 03

Water Body (Category 5h: Impaired, Historic Data)	Assessment Unit
Lye Creek	04100008 02 04
Upper Eagle Creek	04100008 03 01
Lower Eagle Creek	04100008 03 02
Aurand Run	04100008 03 03
Tiderishi Creek	04100008 05 01
Ottawa Creek	04100008 05 02
Moffitt Ditch	04100008 05 03
Dukes Run	04100008 05 04
Dutch Run	04100008 05 05
Town of Pemberville-Portage River	04100010 03 02
Sugar Creek	04100010 04 01
Larcarpe Creek Outlet #4-Portage River	04100010 04 02
Little Portage River	04100010 05 01
Upper Tousant Creek	04100010 06 01
Packer Creek	04100010 06 02
Headwaters Paramour Creek-Sandusky River	04100011 04 01
Loss Creek-Sandusky River	04100011 04 02
Headwaters Middle Sanduskey River	04100011 04 03
Grass Run	04100011 04 04
Headwaters Lower Sandusky River	04100011 04 05
Town of Upper Sandusky-Sandusky River	04100011 07 02
Negro Run	04100011 07 03
Cranberry Run-Sandusky River	04100011 07 04
Sugar Run-Sandusky River	04100011 07 05
Clear Creek-Vermilion River	04100012 01 01
Buck Creek	04100012 01 02
Southwest Branch Vermilion River	04100012 01 03
New London Upground Reservoir-Vermilion River	04100012 01 04
Indian Creek-Vermilion River	04100012 01 05
East Branch Vermilion River	04100012 02 01
East Fork Vermilion River	04100012 02 02
Town of Wakeman-Vermilion River	04100012 02 03
Mouth Vermilion River	04100012 02 04
Plum Creek	04110001 01 01
North Branch West Branch Rocky River	04110001 01 02
Headwaters West Branch Rocky River	04110001 01 03
Mallet Creek	04110001 01 04
Plum Creek	04110001 01 07
East Fork of East Branch Black River	04110001 03 01
Headwaters West Fork East Branch Black River	04110001 03 02

Water Body (Category 5h: Impaired, Historic Data)	Assessment Unit
Willow Creek	04110001 04 03
Upper West Branch Black River	04110001 05 02
Middle West Branch Black River	04110001 05 04
Plum Creek	04110001 05 05
French Creek	04110001 06 01
West Branch Cuyahoga River	04110002 01 02
Tare Creek-Cuyahoga River	04110002 01 03
Black Brook	04110002 01 05
Potter Creek-Breakneck Creek	04110002 02 01
Feeder Canal-Breakneck Creek	04110002 02 02
Plum Creek	04110002 03 01
City of Akron-Little Cuyahoga River	04110002 03 04
Yellow Creek	04110002 04 02
Furnace Run	04110002 04 03
Brandywine Creek	04110002 04 04
Pond Brook	04110002 05 01
Headwaters Tinkers Creek	04110002 05 02
Headwaters Chippewa Creek	04110002 05 03
Town of Twinsburg-Tinkers Creek	04110002 05 04
East Branch Ashtabula River	04110003 01 01
West Branch Ashtabula River	04110003 01 02
Upper Ashtabula River	04110003 01 03
Dead Branch	04110004 01 01
Headwaters Grand River	04110004 01 02
Baughman Creek	04110004 01 03
Swine Creek	04110004 01 06
Upper Rock Creek	04110004 02 01
Lower Rock Creek	04110004 02 03
Phelps Creek	04110004 03 01
Hoskins Creek	04110004 03 02
Mill Creek-Grand River	04110004 03 03
Mud Creek	04110004 03 04
Plumb Creek-Grand River	04110004 03 05
Three Brothers Creek-Grand River	04110004 05 01
East Branch Middle Fork Little Beaver Creek	05030101 04 01
Stone Mill Run-Middle Fork Little Beaver Creek	05030101 04 03
Lisbon Creek-Middle Fork Little Beaver Creek	05030101 04 04
Longs Run	05030101 06 01
Honey Creek	05030101 06 02
Headwaters North Fork Little Beaver Creek	05030101 06 03

Water Body (Category 5h: Impaired, Historic Data)	Assessment Unit
Little Bull Creek	05030101 06 04
Headwaters Bull Creek	05030101 06 05
Leslie Run-Bull Creek	05030101 06 06
Dilworth Run-North Fork Little Beaver Creek	05030101 06 07
Brush Run-North Fork Little Beaver Creek	05030101 06 08
Rough Run-Little Beaver Creek	05030101 06 09
Bieler Run-Little Beaver Creek	05030101 06 10
Headwaters Yellow Creek	05030101 07 01
Elkhorn Creek	05030101 07 02
Upper North Fork	05030101 07 03
Headwaters North Fork Yellow Creek	05030101 08 02
Salt Run-North Fork Yellow Creek	05030101 08 03
Upper Cross Creek	05030101 10 01
Salem Creek	05030101 10 02
Middle Cross Creek	05030101 10 03
Frontal Pymatuning Reservoir	05030102 01 04
Willow Creek	05030103 02 02
Mill Creek	05030103 02 03
Kale Creek	05030103 03 01
Headwaters West Branch Mahoning River	05030103 03 02
Barrel Run	05030103 03 03
Headwaters Eagle Creek	05030103 04 01
South Fork Eagle Creek	05030103 04 02
Camp Creek-Eagle Creek	05030103 04 03
Tinkers Creek	05030103 04 04
Burgess Run-Yellow Creek	05030103 08 06
Crabapple Creek	05030106 03 01
Headwaters Wheeling Creek	05030106 03 02
Flat Run-Wheeling Creek	05030106 03 04
Buffalo Run-West Fork Duck Creek	05030201 09 02
New Years Creek-Duck Creek	05030201 09 03
Horse Cave Creek	05030202 03 01
Headwaters East Branch Shade River	05030202 03 02
Big Run-East Branch Shade River	05030202 03 03
Spruce Creek-Shade River	05030202 03 04
Baldwin Run	05030204 04 02
Pleasant Run	05030204 04 03
Tarhe Run-Hocking River	05030204 04 04
Buck Run-Hocking River	05030204 04 05
Scott Creek	05030204 06 02

Water Body (Category 5h: Impaired, Historic Data)	Assessment Unit
Oldtown Creek	05030204 06 03
Fivemile Creek	05030204 06 04
Headwaters Tuscarawas River	05040001 01 01
Pigeon Creek	05040001 01 02
Hudson Run	05040001 01 03
Wolf Creek	05040001 01 04
Headwaters Chippewa Creek	05040001 02 01
Hubbard Creek-Chippewa Creek	05040001 02 02
Little Chippewa Creek	05040001 02 03
River Styx	05040001 02 04
Tommy Run-Chippewa Creek	05040001 02 05
Red Run	05040001 02 06
Silver Creek-Chippewa Creek	05040001 02 07
Pancake Creek-Tuscarawas River	05040001 03 01
Lake Lucern-Nimisila Creek	05040001 03 03
Fox Run	05040001 03 04
Headwaters Newman Creek	05040001 03 06
Town of North Lawrence-Newman Creek	05040001 03 07
Sippo Creek	05040001 03 08
Conser Run	05040001 04 01
Middle Branch Sandy Creek	05040001 04 02
Pipes Fork-Still Fork	05040001 04 03
Muddy Fork	05040001 04 04
Reeds Run-Still Fork	05040001 04 05
Swartz Ditch-Middle Branch Nimishillen Creek	05040001 05 01
East Branch Nimishillen Creek	05040001 05 02
West Branch Nimishillen Creek	05040001 05 03
City of Canton-Middle Branch Nimishillen Creek	05040001 05 04
Sherrick Run-Nimishillen Creek	05040001 05 05
Town of East Sparta-Nimishillen Creek	05040001 05 06
Hugle Run	05040001 06 01
Pipe Run	05040001 06 02
Black Run	05040001 06 03
Little Sandy Creek	05040001 06 04
Indian Run-Sandy Creek	05040001 06 06
Village of Pavonia-Black Fork Mohican River	05040002 02 01
Headwaters Rocky Fork	05040002 02 03
Outlet Rocky Fork	05040002 02 04
Charles Mill-Black Fork Mohican River	05040002 02 05
Headwaters Wakatomika Creek	05040004 01 01

Water Body (Category 5h: Impaired, Historic Data)	Assessment Unit
Winding Fork	05040004 01 02
Brushy Fork	05040004 01 03
Black Run-Walatomika Creek	05040004 02 01
Mill Fork	05040004 02 02
Little Wakatomika Creek	05040004 02 03
Claylick Creek	05040006 05 01
Lost Run	05040006 05 02
Rock Fork	05060001 03 01
Honey Creek-Little Scioto River	05060001 03 04
Panther Creek	05060001 04 02
Wolf Creek-Scioto River	05060001 04 03
Wildcat Creek	05060001 04 04
Glade Run-Scioto River	05060001 04 06
Mud Run	05060001 08 02
Flat Run	05060001 08 03
Town of Caledonia-Olentangy River	05060001 08 04
Shaw Creek	05060001 09 01
Otter Creek-Olentangy River	05060001 10 01
Grave Creek	05060001 10 02
Qu Qua Creek	05060001 10 04
Pawpaw Creek	05060001 17 01
Poplar Creek	05060001 17 03
Sycamore Creek	05060001 17 04
Georges Creek	05060001 18 01
Tussing Ditch-Walnut Creek	05060001 18 02
Turkey Run	05060001 18 03
Little Walnut Creek	05060001 18 04
Mud Run-Walnut Creek	05060001 18 06
Headwaters Big Darby Creek	05060001 19 01
Buck Run	05060001 19 03
Sugar Run	05060001 19 04
Headwaters Treacle Creek	05060001 20 01
Proctor Run-Treacle Creek	05060001 20 02
Headwaters Little Darby Creek	05060001 20 03
Spring Fork	05060001 20 04
Gay Run-Big Darby Creek	05060001 22 02
Grove Run-Scioto River	05060001 23 04
Hargus Creek	05060002 04 01
Yellowbud Creek	05060002 04 02
Congo Creek	05060002 04 04

Water Body (Category 5h: Impaired, Historic Data)	Assessment Unit
Beech Fork	05060002 06 01
Headwaters Salt Creek	05060002 06 02
Laurel Run	05060002 06 03
Pine Creek	05060002 06 04
East Fork Queer Creek	05060002 09 01
Queer Creek	05060002 09 02
Pretty Run	05060002 09 03
Pike Run	05060002 09 04
Village of Eagle Mills-Salt Creek	05060002 09 05
Indian Creek	05060002 10 01
Dry Run	05060002 10 02
Headwaters Walnut Creek	05060002 10 03
Lick Run-Walnut Creek	05060002 10 04
Headwaters Paint Creek	05060003 01 01
East Fork Paint Creek	05060003 01 02
Indian Creek-Paint Creek	05060003 06 01
Farmers Run-Paint Creek	05060003 06 02
Cherokee Mans Run	05080001 03 01
Rennick Creek-Great Miami River	05080001 03 02
Rum Creek	05080001 03 03
Blue Jacket Creek	05080001 03 04
Bokengehalas Creek	05080001 03 05
Brandywine Creek-Great Miami River	05080001 03 06
McKees Creek	05080001 04 01
Lee Creek	05080001 04 02
Indian Creek	05080001 04 04
Plum Creek	05080001 04 05
Turkeyfoot Creek-Great Miami River	05080001 04 06
Machochee Creek	05080001 15 01
Headwaters Mad River	05080001 15 02
Kings Creek	05080001 15 03
Glady Creek-Mad River	05080001 15 04
Muddy Creek	05080001 16 01
Dugan Run	05080001 16 02
Nettle Creek	05080001 16 03
Anderson Creek	05080001 16 04
Storms Creek	05080001 16 05
Chapman Creek	05080001 16 06
Bogles Run-Mad River	05080001 16 07
Moore Run	05080001 18 01

Water Body (Category 5h: Impaired, Historic Data)	Assessment Unit
Pondy Creek-Mad River	05080001 18 02
Mill Creek	05080001 18 03
Donnels Creek	05080001 18 04
Rock Run-Mad River	05080001 18 05
Jackson Creek-Mad River	05080001 18 06
Mud Creek	05080001 19 01
Mud Run	05080001 19 02
Poplar Creek-Great Miami River	05080001 20 05
North Branch Wolf Creek	05080002 01 01
Headwaters Wolf Creek	05080002 01 02
Holes Creek	05080002 01 04
Millers Fork	05080002 02 01
Headwaters Twin Creek	05080002 02 02
Swamp Creek	05080002 02 03
Price Creek	05080002 02 04
Bantas Fork	05080002 03 01
Aukerman Creek	05080002 03 02
Toms Run	05080002 03 03
Little Twin Creek	05080002 03 05
Elk Creek	05080002 07 01
Shaker Creek	05080002 07 03
Dicks Creek	05080002 07 04
Gregory Creek	05080002 07 05
Pleasant Run	05080002 09 01
Paddys Run	05080002 09 03
Taylor Creek	05080002 09 05
Hales Creek	05090103 02 01
Headwaters Pine Creek	05090103 02 02
Little Pine Creek	05090103 02 03
Big Threemile Creek	05090201 06 04
Headwaters Little Miami River	05090202 01 01
North Fork Little Miami River	05090202 01 02
Buffenbarger Cemetery-Little Miami River	05090202 01 03
Yellow Springs Creek-Little Miami River	05090202 01 04
North Fork Massies Creek	05090202 02 01
South Fork Massies Creek	05090202 02 02
Massies Creek	05090202 02 03
Little Beaver Creek	05090202 02 04
Beaver Creek	05090202 02 05
Shawnee Creek-Little Miami River	05090202 02 06

Water Body (Category 5h: Impaired, Historic Data)	Assessment Unit
Sugar Creek	05090202 05 01
Town of Bellbrook-Little Miami River	05090202 05 02
Glady Run	05090202 05 03
East Fork Mill Creek-Mill Creek	05090203 01 01
West Fork Mill Creek	05090203 01 02
Sharon Creek-Mill Creek	05090203 01 03
Congress Run-Mill Creek	05090203 01 04
Chickasaw Creek	05120101 02 01
Headwaters Beaver Creek	05120101 02 02
Coldwater Creek	05120101 02 03

Table E-10. Waters with current fish tissue data where inadequate samples exist to determine impairment status. These waters are category 3i.

Water Body (Category 3i: Insufficient Data)	Assessment Unit
Cornell Ditch-Fish Creek	04100003 04 06
Lower Lick Creek	04100006 04 04
Dry Run-Auglaize River	04100007 01 05
Middle Creek	04100007 08 05
Lower Blue Creek	04100007 10 04
Upper Powell Creek	04100007 11 02
Lower Powell Creek	04100007 11 03
Eagle Creek-Auglaize River	04100007 12 09
Village of Gilboa-Blanchard River	04100008 05 06
Grassy Creek	04100009 09 02
Delaware Creek-Maumee River	04100009 09 04
Town of Bloomdale-South Branch Portage River	04100010 02 03
Otter Creek-Frontal Lake Erie	04100010 07 06
Mills Creek	04100011 01 03
Pickerel Creek	04100011 02 03
Raccoon Creek	04100011 02 04
Beaver Creek	04100011 12 02
Muskellunge Creek	04100011 13 01
Frink Run	04100012 05 03
Marsh Run-Conneaut Creek	04120101 06 05
Chocolate Run-Mahoning River	05030103 04 06
Piney Creek-Captina Creek	05030106 09 04
Cat Run-Captina Creek	05030106 09 06
Lower Sunfish Creek	05030201 01 04
Straight Fork-Little Muskingum River	05030201 06 05
Wingett Run-Little Muskingum River	05030201 07 03

Water Body (Category 3i: Insufficient Data)	Assessment Unit
Mouth Clear Creek	05030204 03 02
Brandywine Creek-Sugar Creek	05040001 11 05
Evans Creek	05040001 19 01
Jerome Fork-Mohican River	05040002 06 05
Town of Perrysville-Black Fork Mohican River	05040002 08 02
Big Run-Black Fork Mohican River	05040002 08 03
Job Run-North Branch Kokosing River	05040003 01 03
Granny Creek-Kokosing River	05040003 02 03
Delano Run-Kokosing River	05040003 03 04
Indianfield Run-Kokosing River	05040003 03 07
Jennings Ditch-Killbuck Creek	05040003 06 04
Buckeye Fork	05040004 04 04
Painter Creek-Jonathon Creek	05040004 04 07
Manns Fork Salt Creek	05040004 06 05
Flat Run-Muskingum River	05040004 08 02
Depue Run-Seneca Fork	05040005 01 04
Chapman Run	05040005 02 06
Salt Fork Lake-Sugartree Fork	05040005 04 05
Sarchet Run-Wills Creek	05040005 05 04
Headwaters Little Scioto River	05060001 03 02
City of Marion-Little Scioto River	05060001 03 03
Brush Run-Bokes Creek	05060001 07 02
Smith Run-Bokes Creek	05060001 07 03
Eversole Run	05060001 12 01
Dear Creek Dam-Deer Creek	05060002 02 07
State Run-Deer Creek	05060002 03 04
Lick Run-Scioto River	05060002 05 03
Headwaters Little Salt Creek	05060002 08 01
Buckeye Creek	05060002 08 02
Horse Creek-Little Salt Creek	05060002 08 03
Big Branch-Rattlesnake Creek	05060003 04 07
Biers Run-North Fork Paint Creek	05060003 09 04
Dismal Creek	05080001 10 01
Ludlow Creek	05080001 14 02
Sinking Creek	05080001 17 03
Town of New Miami-Great Miami River	05080002 07 06
Banklick Creek-Great Miami River	05080002 09 02
Sterling Run	05090201 10 01
Bear Creek-Ohio River	05090201 11 06
Mouth Anderson Fork	05090202 03 03

Water Body (Category 3i: Insufficient Data)	Assessment Unit
East Fork Todd Fork	05090202 07 01
Headwaters Wabash River	05120101 01 01

Table E-11. Large rivers and their impairment status.

Water Body (Large Rivers)	Assessment Unit	Impairment Status
Auglaize River (Ottawa River to mouth)	04100007 90 01	**Impaired (PCBs)**
Blanchard River (Dukes Run to mouth)	04100008 90 01	**Impaired (PCBs)**
Cuyahoga River (Brandywine Cr. to mouth)	04110002 90 01	**Impaired (PCBs)**
Grand River (Mill Creek to mouth)	04110004 90 01	**Impaired (historical)**
Great Miami River (Four Mile Creek to Ohio River)	05080002 90 02	**Impaired (PCBs)**
Great Miami River (Mad River to Four Mile Creek)	05080002 90 01	**Impaired (PCBs)**
Great Miami River (Tawawa Creek to Mad River)	05080001 90 01	**Impaired (PCBs)**
Hocking River (Scott Creek to Margaret Creek)	05030204 90 01	**Impaired (historical)**
Hocking River (Margaret Creek to Ohio River)	05030204 90 02	**Impaired (historical)**
Licking River (entire length); excluding Dillon Lake	05040006 90 01	**Impaired (PCBs)**
Little Miami River (Caesar Creek to O'Bannon Creek)	05090202 90 01	**Impaired (PCBs)**
Little Miami River (O'Bannon Creek to Ohio River)	05090202 90 02	**Impaired (PCBs)**
Mad River (Donnels Creek to mouth)	05080001 90 03	**Impaired (historical)**
Mahoning River (Eagle Creek to Pennsylvania Border)	05030103 90 01	**Impaired (PCBs)**
Maumee River (Beaver Creek to Maumee Bay)	04100009 90 02	**Impaired (PCBs)**
Maumee River (IN border to Tiffin River)	04100005 90 01	**Impaired (PCBs)**
Maumee River (Tiffin River to Beaver Creek)	04100009 90 01	**Impaired (PCBs, mercury)**
Mohican River (entire length)	05040002 90 01	**Impaired (PCBs)**
Muskingum River (Licking River to Meigs Creek)	05040004 90 02	**Impaired (PCBs)**
Muskingum River (Meigs Creek to Ohio River)	05040004 90 03	**Impaired (PCBs)**
Muskingum River (Tuscarawas/Walhonding confluence to Licking River)	05040004 90 01	**Impaired (PCBs)**
Paint Creek (Rocky Fork to mouth)	05060003 90 01	**Impaired (PCBs)**
Raccoon Creek (Little Raccoon Creek to mouth)	05090101 90 01	Insufficient data
Sandusky River (Tymochtee Creek to Wolf Creek)	04100011 90 01	**Impaired (PCBs)**
Sandusky River (Wolf Creek to Sandusky Bay)	04100011 90 02	**Impaired (PCBs)**
Scioto River (Big Darby Creek to Paint Creek)	05060002 90 01	**Impaired (PCBs)**
Scioto River (L. Scioto R. to Olentangy R.)	05060001 90 01	**Impaired (PCBs)**
Scioto River (Olentangy River to Big Darby Creek)	05060001 90 02	**Impaired (PCBs)**
Scioto River (Paint Creek to Sunfish Creek)	05060002 90 02	**Impaired (PCBs)**
Scioto River (Sunfish Creek to Ohio River)	05060002 90 03	**Impaired (PCBs)**
Stillwater River (Greenville Creek to mouth)	05080001 90 02	Not impaired
Tiffin River (Brush Creek to mouth)	04100006 90 01	**Impaired (PCBs)**
Tuscarawas River (Chippewa Creek to Sandy Creek)	05040001 90 01	**Impaired (historical)**
Tuscarawas River (Sandy Creek to Stillwater Creek)	05040001 90 02	**Impaired (historical)**

Water Body (Large Rivers)	Assessment Unit	Impairment Status
Tuscarawas River (Stillwater Creek to Muskingum River)	05040001 90 03	**Impaired (historical)**
Walhonding River (entire length)	05040003 90 01	**Impaired (PCBs)**
Whitewater River (entire length)	05080003 90 01	**Impaired (PCBs)**
Wills Creek (Salt Fork to mouth)	05040005 90 01	Insufficient data

Table E-12. Inland lakes and their impairment status.

Water Body (Inland Lakes)	Impairment status (cause)
Acton Lake	Not Impaired
Adams Lake	Not Impaired
Alum Creek Reservoir	Not Impaired
Amick Reservoir	Insufficient data
Apple Valley Lake	Not Impaired
Archbold Reservoir	Insufficient data
Barnesville Reservoir #1	Insufficient data
Barnesville Reservoir #2	Insufficient data
Barnesville Reservoir #3	Not Impaired
Beach City Reservoir	Insufficient data
Beaver Creek Reservoir	Not Impaired
Bellevue Reservoir	Insufficient data
Belmont Lake	Insufficient data
Berlin Reservoir	Insufficient data
Buckeye Lake	Not Impaired
Bucyrus Reservoir #2	Insufficient data
Burr Oak Reservoir	Not Impaired
Caesar Creek Lake	Not Impaired
Caldwell Lake	Not Impaired
Charles Mill Reservoir	Insufficient data
CJ Brown Reservoir	Not Impaired
Clark Lake	Insufficient data
Clear Fork Reservoir[5]	Impaired (PCBs)
Clendening Lake	Not Impaired
Confluence Park Pond # 1	Insufficient data
Confluence Park Pond # 2	Insufficient data
Confluence Park Pond # 3	Insufficient data
Cowan Lake	Not Impaired
Cutler Lake	Insufficient data
Dale Walborn Reservoir	Not Impaired

[5] Shaded rows indicate impaired lakes.

Water Body (Inland Lakes)	Impairment status (cause)
Daugherty Lake	Insufficient data
Dave Heisy Pond	Insufficient data
Deer Creek Reservoir (Mahoning basin)	Impaired (PCBs)
Deer Creek Reservoir (Scioto basin)	Not Impaired
Delaware Reservoir	Not Impaired
Delphos Reservoir	Insufficient data
Delta Reservoir #1	Insufficient data
Delta Reservoir #2	Insufficient data
Dillon Lake	Not Impaired
Dow Lake	Not Impaired
East Branch Reservoir	Not Impaired
East Fork Lake	Not Impaired
East Reservoir	Insufficient data
Eastwood Lake	Insufficient data
Ferguson Reservoir	Not Impaired
Findlay Reservoir #1	Insufficient data
Findlay Reservoir #2	Insufficient data
Findley Lake	Not Impaired
Forked Run Lake	Not Impaired
Fostoria #3	Insufficient data
Fox Lake	Not Impaired
Friendship Park Lake	Insufficient data
Grand Lake St. Marys	Impaired (PCBs)
Grant Lake	Insufficient data
Greenfield Lake	Not Impaired
Griggs Reservoir	Not Impaired
Hammertown Lake	Insufficient data
Hargus Lake	Insufficient data
Highlandtown Lake	Not Impaired
Hinckley Lake	Insufficient data
Hoover Reservoir	Not Impaired
Indian Lake	Not Impaired
Jackson Lake	Insufficient data
Jefferson Lake	Not Impaired
Killdeer Pond #30	Not Impaired
Killdeer Reservoir	Insufficient data
Kiser Lake	Not Impaired
Knox Lake	Insufficient data

Water Body (Inland Lakes)	Impairment status (cause)
Kokosing Lake	Insufficient data
LaDue Reservoir	Impaired (PCBs)
Lake Alma	Not Impaired
Lake Ann	Insufficient data
Lake Girard	Insufficient data
Lake Glacier	Not Impaired
Lake Hamilton	Insufficient data
Lake Hope	Not Impaired
Lake Isabella	Insufficient data
Lake Jisco	Insufficient data
Lake Katherine	Insufficient data
Lake LaComte	Insufficient data
Lake LaSuAn	Insufficient data
Lake Lavere	Insufficient data
Lake Logan	Not Impaired
Lake Loramie	Not Impaired
Lake Mel	Insufficient data
Lake Milton	Impaired (PCBs)
Lake Olander	Not Impaired
Lake Rockwell	Impaired (PCBs)
Lake Rupert	Not Impaired
Lake Snowden	Insufficient data
Lake Sue	Insufficient data
Lake Vesuvius	Not Impaired
Lake White	Not Impaired
Lake Wood Duck	Insufficient data
Lamberjack Lake	Insufficient data
Lima Lake	Insufficient data
Long Lake	Insufficient data
Lost Creek Reservoir	Insufficient data
Madison Lake	Insufficient data
Maysville Ws Reservoir	Insufficient data
McComb Reservoir #1	Insufficient data
McComb Reservoir #2	Insufficient data
Meadowbrook Lake	Insufficient data
Meander Creek Reservoir	Not Impaired
Metzger Reservoir	Insufficient data
Milton Lake	Insufficient data

Water Body (Inland Lakes)	Impairment status (cause)
Mogadore Reservoir	Not Impaired
Mosier Lake	Insufficient data
Mosquito Lake	Not Impaired
Nesmith Lake	Insufficient data
Nettle Lake	Insufficient data
New Lexington Reservoir	Insufficient data
New London Reservoir	Insufficient data
New Lyme Lake	Not Impaired
Nimisila Reservoir	Not Impaired
North Baltimore	Insufficient data
North Fork Kokosing Reservoir	Not Impaired
Norwalk Reservoir #3	Not Impaired
Oakthorpe Lake	Insufficient data
O'shaughnessy Reservoir	Not Impaired
Oxbow Lake	Insufficient data
Paint Creek Lake	Not Impaired
Paulding Reservoir	Insufficient data
Piedmont Lake	Not Impaired
Pike Lake	Not Impaired
Pine Lake	Insufficient data
PJ Outhwaite Reservoir	Insufficient data
Pleasant Hill Reservoir	Not Impaired
Powers Reservoir	Insufficient data
Punderson Lake	Insufficient data
Pymatuning Reservoir	Not Impaired
Raccoon Creek	Insufficient data
Rock Mill Reservoir	Insufficient data
Rocky Fork Lake	Not Impaired
Rose Lake	Not Impaired
Ross Lake	Not Impaired
Rush Creek Lake	Insufficient data
Rush Run Lake	Not Impaired
Salt Fork Reservoir	Not Impaired
Schoonover Reservoir	Impaired (Mercury)
Seneca Lake	Insufficient data
Shelby Reservoir #3	Insufficient data
St. Joseph Lake	Not Impaired
Stewart Lake	Insufficient data

Water Body (Inland Lakes)	Impairment status (cause)
Stonelick Lake	Not Impaired
Summit Lake	Impaired (PCBs)
Swift Run Lake	Insufficient data
Tappan Lake	Not Impaired
Turkey Creek Lake	Not Impaired
Tycoon Lake	Insufficient data
Upper Sandusky Reservoir	Insufficient data
Van Wert Reservoir #1	Insufficient data
Van Wert Reservoir #2	Insufficient data
Veteran's Memorial (Maumee basin)	Not Impaired
Veteran's Memorial (Portage basin)	Insufficient data
Veto Lake	Insufficient data
Wabash Reservoir	Insufficient data
Wellington Upground Reservoir	Insufficient data
West Branch Reservoir	Impaired (PCBs)
Westville Lake	Impaired (PCBs)
Willard Reservoir	Insufficient data
Wills Creek Reservoir	Not Impaired
Wingfoot Lake	Not Impaired
Wolf Run Lake	Insufficient data

E4. Supplemental Information

E4.1 Calculation of Fish Concentrations from Water Quality Standards Inputs

For carcinogens:

$$Fish\ Concentration(mg/kg) = \frac{\left[\dfrac{Cancer\ \ Risk\ \ Level}{q1*\left((mg/kg/d)^{-1}\right)}\right] \times Body\ Weight\ (kg)}{Fish\ Consumption\ (kg/d)}$$

For noncarcinogens:

$$\text{Fish Concentration}(\text{mg/kg}) = \frac{\text{RfD}(\text{mg/kg/d}) \times \text{Body Weight}(\text{kg}) \times \text{RSC}}{\text{Fish Consumption}(\text{kg/d})}$$

For wildlife:

$$\text{Fish Concentration}(\text{mg/kg}) = \text{Wildlife WQC}(\text{mg/L}) \times \text{BAF TL}_n(\text{L/kg})$$

Lake Erie Drainage Basin

	Mercury	Chlordane	DDT	PCBs	Hexachloro-benzene	Mirex
HHWQC	3.1 ng/L	2.4 µg/L	0.15 ng/L	0.026 ng/L	0.45 ng/L	0.074 ng/L
Wildlife Criteria	1.3 ng/L	N/A	0.011 ng/L	0.12 ng/L	N/A	N/A
The following inputs on which the WQS are based are used to calculate fish concentrations:						
Reference Dose (RfD)	1E-04 mg/kg/d	N/A	N/A	N/A	N/A	N/A
Slope Factor (q1*)	N/A	0.35 $(mg/kg/d)^{-1}$	0.34 $(mg/kg/d)^{-1}$	2.0 $(mg/kg/d)^{-1}$	1.6 $(mg/kg/d)^{-1}$	0.53 $(mg/kg/d)^{-1}$
Cancer Risk Level	N/A	1E-05	1E-05	1E-05	1E-05	1E-05
Body Weight	65 kg	70 kg	70 kg	70 kg	70 kg	70 kg
Trophic Level Three Bioaccumulation Factor (BAF TL^3)	27,900	116,600	376,400	520,900	43,690	353,000
Trophic Level Four Bioaccumulation Factor (BAF TL^4)	140,000	154,200	1,114,000	1,871,000	71,080	1,461,000
Fish Consumption	0.015 kg/d	0.015 kg/d	0.015 kg/d	0.015 kg/d	0.015 kg/d	0.015 kg/d
Relative Source Contribution Factor (RSC)	0.8	N/A	N/A	N/A	N/A	N/A

Source: U.S. EPA. 1995. Great Lakes Water Quality Initiative Criteria Documents for the Protection of Human Health. EPA-820-B-95-006. March 1995.

Derivation of Concentrations

Lake Erie Drainage Basin Mercury Human Health Fish Concentration

$$\frac{1E-04(mg/kg/d)\times 65(kg)\times 0.8}{0.015(kg/d)}=0.35(mg/kg)=350(\mu g/kg)$$

Lake Erie Drainage Basin Mercury Wildlife Fish Concentration

Trophic Level 3:

$$1.3E-06(mg/L)\times 27{,}900(L/kg)=0.036(mg/kg)=36(\mu g/kg)$$

Trophic Level 4:

$$1.3E-06(mg/L)\times 140{,}000(L/kg)=0.18(mg/kg)=180(\mu g/kg)$$

Lake Erie Drainage Basin Chlordane Human Health Fish Concentration

$$\frac{\left\lfloor \frac{1E-05}{0.35(mg/kg/d)^{-1}} \right\rfloor \times 70(kg)}{0.015(kg/d)}=0.13(mg/kg)=130(\mu g/kg)$$

Lake Erie Drainage Basin DDT Human Health Fish Concentration

$$\frac{\left\lfloor \frac{1E-05}{0.34(mg/kg/d)^{-1}} \right\rfloor \times 70(kg)}{0.015(kg/d)}=0.14(mg/kg)=140(\mu g/kg)$$

Lake Erie Drainage Basin DDT Wildlife Fish Concentration

Trophic Level 3:

$$1.1E-08(mg/L)\times 376{,}400(L/kg)=0.0041(mg/kg)=4.1(\mu g/kg)$$

Trophic Level 4:

$$1.1E-08(mg/L)\times 1{,}140{,}000(L/kg)=0.012(mg/kg)=12(\mu g/kg)$$

Lake Erie Drainage Basin PCB Human Health Fish Concentration

$$\frac{\left\lfloor \frac{1E-05}{2.0(mg/kg/d)^{-1}} \right\rfloor \times 70(kg)}{0.015(kg/d)}=0.023(mg/kg)=23(\mu g/kg)$$

Lake Erie Drainage Basin PCB Wildlife Fish Concentration

Trophic Level 3:

$$1.2\text{E}-07(\text{mg}/\text{L})\times 520{,}900(\text{L}/\text{kg}) = 0.062(\text{mg}/\text{kg}) = 62(\mu\text{g}/\text{kg})$$

Trophic Level 4:

$$1.2\text{E}-07(\text{mg}/\text{L})\times 1{,}871{,}000(\text{L}/\text{kg}) = 0.22(\text{mg}/\text{kg}) = 220(\mu\text{g}/\text{kg})$$

Lake Erie Drainage Basin Hexachlorobenzene Human Health Fish Concentration

$$\frac{\left[\dfrac{1\text{E}-05}{1.6(\text{mg}/\text{kg}/\text{d})^{-1}}\right]\times 70(\text{kg})}{0.015(\text{kg}/\text{d})} = 0.029(\text{mg}/\text{kg}) = 29(\mu\text{g}/\text{kg})$$

Lake Erie Drainage Basin Mirex Human Health Fish Concentration

$$\frac{\left[\dfrac{1\text{E}-05}{0.53(\text{mg}/\text{kg}/\text{d})^{-1}}\right]\times 70(\text{kg})}{0.015(\text{kg}/\text{d})} = 0.088(\text{mg}/\text{kg}) = 88(\mu\text{g}/\text{kg})$$

Ohio River Drainage Basin

	Mercury	Chlordane	DDT	PCBs	Hexachloro-benzene	Mirex
HHWQC	12 ng/L*	21 ng/L	5.9 ng/L	1.7 ng/L	7.5 ng/L	0.11 ng/L
The following inputs on which the WQS are based are used to calculate fish concentrations:						
Reference Dose (RfD)	N/A	N/A	N/A	N/A	N/A	N/A
Slope Factor (q1*)	N/A	0.35 $(mg/kg/d)^{-1}$	0.34 $(mg/kg/d)^{-1}$	2.0 $(mg/kg/d)^{-1}$	1.6 $(mg/kg/d)^{-1}$	0.53 $(mg/kg/d)^{-1}$
Cancer Risk Level	N/A	1E-05	1E-05	1E-05	1E-05	1E-05
Body Weight	N/A	70 kg	70 kg	70 kg	70 kg	70 kg
Fish Consumption	N/A	0.0065 kg/d	0.0065 kg/d	0.0065 kg/d	0.0065 kg/d	0.0065 kg/d
Relative Source Contribution Factor (RSC)	N/A	N/A	N/A	N/A	N/A	N/A

* Based on the FDA action level of 1 mg/kg divided by the BCF of 83,333 L/kg.

Ohio River Drainage Basin Mercury Fish Concentration

1 mg/kg based on FDA action level

Ohio River Drainage Basin Chlordane Fish Concentration

$$\frac{\left\lfloor \dfrac{1E-05}{0.35(\mathrm{mg/kg/d})^{-1}} \right\rfloor \times 70(\mathrm{kg})}{0.0065(\mathrm{kg/d})} = 0.31(\mathrm{mg/kg}) = 310(\mu\mathrm{g/kg})$$

Ohio River Drainage Basin DDT Fish Concentration

$$\frac{\left\lfloor \dfrac{1E-05}{0.34(\mathrm{mg/kg/d})^{-1}} \right\rfloor \times 70(\mathrm{kg})}{0.0065(\mathrm{kg/d})} = 0.32(\mathrm{mg/kg}) = 320(\mu\mathrm{g/kg})$$

Ohio River Drainage Basin PCB Fish Concentration

$$\frac{\left\lfloor \dfrac{1E-05}{2.0(\mathrm{mg/kg/d})^{-1}} \right\rfloor \times 70(\mathrm{kg})}{0.0065(\mathrm{kg/d})} = 0.054(\mathrm{mg/kg}) = 54(\mu\mathrm{g/kg})$$

Ohio River Drainage Basin Hexachlorobenzene Fish Concentration

$$\frac{\left\lfloor \dfrac{1E-05}{1.6(\mathrm{mg/kg/d})^{-1}} \right\rfloor \times 70(\mathrm{kg})}{0.0065(\mathrm{kg/d})} = 0.067(\mathrm{mg/kg}) = 67(\mu\mathrm{g/kg})$$

Ohio River Drainage Basin Mirex Fish Concentration

$$\frac{\left\lfloor \dfrac{1E-05}{0.53(\mathrm{mg/kg/d})^{-1}} \right\rfloor \times 70(\mathrm{kg})}{0.0065(\mathrm{kg/d})} = 0.20(\mathrm{mg/kg}) = 200(\mu\mathrm{g/kg})$$

Fish Tissue Concentrations for Determining Impairment for the 2016 IR (µg/kg)

	Lake Erie HH	Lake Erie – wildlife TL3	Lake Erie – wildlife TL4	Ohio River
Mercury	350	36	180	1000
Chlordane	130	N/A	N/A	310
DDT	140	4.1	12	320
PCBs	23	62	220	54
Hexachlorobenzene	29	N/A	N/A	67
Mirex	88	N/A	N/A	200

E4.2 What's the Difference between the Fish Consumption Advisory Decision and the Impairment Decision?

Some question may arise as to how the methodology for determining impairment status for the 2016 IR for fish tissue relates to the fish advisories issued by the State of Ohio. Rather than building on fish consumption advisory decisions, the revised methodology draws directly from the fish tissue contaminant database. This change was possible because of better accessibility to the raw data.

In short, the basis for determining impairment for the IR for fish tissue is similar but unrelated to the basis for determining advisories. The WQS calculations assume a certain amount of fish consumption and ensure that level of consumption is safe. The advisory calculations determine what level of fish consumption is safe. Therefore, both are protective of human health. However, advisories and IR impairment status are not directly related.

Advisory thresholds are given as one meal per week, one meal per month, one meal every other month and do not eat. Each threshold is associated with a particular contaminant concentration that is based on consuming an eight-ounce meal. For both PCBs and mercury, those thresholds are 50 parts per billion (ppb) for one meal per week, 220 ppb for one meal per month, 1,000 ppb for one meal every other month and 2,000 ppb for do not eat.

The thresholds used for determining IR categories are based on water quality standards for human health. The water quality standards assume that people are eating a certain quantity of different types of fish over time. The Lake Erie basin WQS calculations for mercury and PCBs assume that people are eating 15 grams of fish per day. The Ohio River basin calculations for PCBs and mercury assume that people are eating 6.5 grams of fish per day.

Advisory thresholds are prescriptive, indicating to people how much fish is safe to eat given a certain level of fish contamination. Water quality standard-based thresholds are descriptive, indicating how much contamination is acceptable in fish given that people are eating a certain amount of certain types of fish. In other words, the advisories tell people how much fish they can safely eat and the water quality standards assume how much fish people are eating and use that information to calculate a "safe" level of contamination in fish.

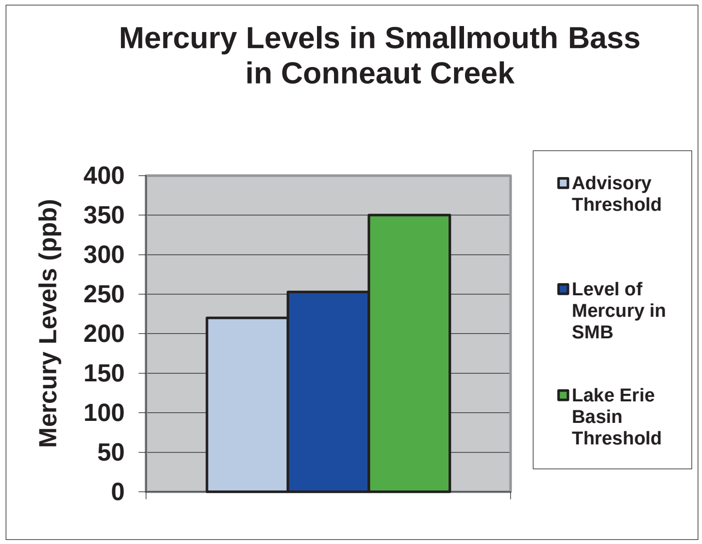
U.S. EPA, in its guidance on developing the IR, indicates that water quality standards are to be used as the basis for determining impairment categories for fish tissue. Because the assumptions used to calculate the advisories are different than the assumptions used to calculate the WQS, this results in cases where some water bodies have advisories against fish consumption but are not listed as impaired and some water bodies are listed as impaired but no fish advisory is in place. This situation is demonstrated in the following table:

Parameter	Lake Erie Basin	Ohio River Basin	1 meal per week advisory	1 meal per month advisory
Fish Consumed	15 grams/day	6.5* grams/day	32.6 grams/day	7.6 grams/day
Maximum Allowable Fish Concentration				
PCB Threshold	23 ppb	54 ppb	50 ppb	220 ppb
Mercury Threshold	350 ppb	1000 ppb	50 ppb	220 ppb

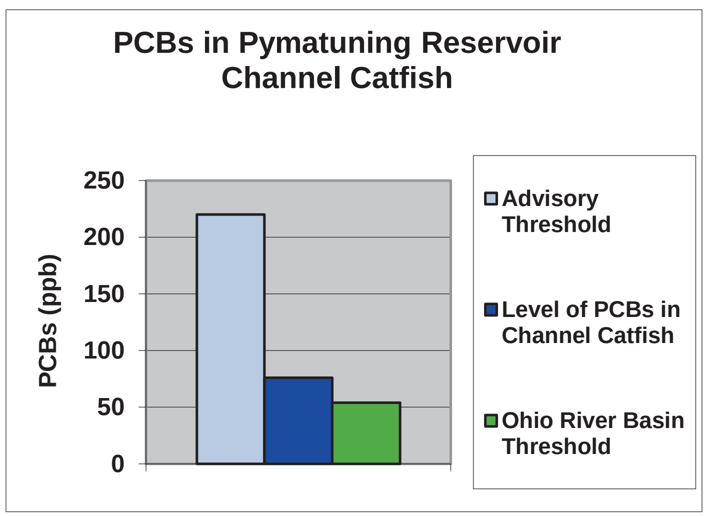
* This value is under review in the current proposed WQS rule update for 3745-1. The proposed value of 17.5 g/day was used in calculating the proportion of trophic level 3 and 4 fish consumed in the Ohio River basin, but was not used in developing the thresholds for determining impairment status.

The reason the thresholds are different between the two basins is that the assumed fish consumption levels are different. The reason the water quality standard thresholds are different from the advisory thresholds is both because the fish consumption levels are different and because for PCBs, a cancer slope factor is used to calculate the water quality standard criteria, which is stricter than the health protection value used to calculate the advisory threshold.

Data for smallmouth bass in Conneaut Creek provide an example where there is an advisory but the water body is not impaired.



Channel catfish in Pymatuning Reservoir show a case where there is no advisory but the water is listed as impaired.



Evaluating Beneficial Use: Recreation

F1. Background

Prior to the 2002 Integrated Report (IR), the reporting of recreation use (RU) impairment in Ohio was sporadic. Clean Water Act (CWA) Section 305(b) reports (1998 and earlier) may have included an indication of the potential for RU impairment in various streams, but a comprehensive listing of recreational use impairment was not included. The 2002 IR employed a uniform methodology to examine readily available data on fecal coliform counts. This approach was based on counting the number of exceedances of the secondary contact RU maximum criterion [5,000 colony forming units (cfu)/100 mL fecal coliform or 576 cfu/100 mL *Escherichia coli (E. coli)]*. Any assessment unit with five or more samples over the last five years above these values was listed as having an impaired RU.

The 2004 IR adopted a more statistically robust methodology for assessing the RU attainment of the state's surface waters linked more directly to the applicable water quality standards. The methodology adopted in 2004 continued to be used through the 2008 IR. The 2008 IR also included a preview of changes anticipated at the time for the 2010 report based on the expectation that the watershed assessment unit (WAU) would change from a larger watershed size (11-digit HUC) to a smaller watershed size (12-digit HUC) and on four anticipated revisions to the water quality standards: 1) dropping the fecal coliform criteria; 2) creation of a tiered set of classes of primary contact recreation waters based on RU intensity; 3) revision of the geometric mean averaging period; and 4) extension of the recreation season. Revisions to the water quality standards pertaining to the RU were adopted on December 15, 2009. The linkage of the methodology to the Ohio water quality standards (WQS) is summarized in Table F-1 and subsequent text. The RU assessment method employed in this report is essentially the same as used in the 2010, 2012 and 2014 reports.

Table F-1. Summary of the RU assessment methods.

Bathing Waters		
Indicator	**Criterion (Table 7-13, OAC 3745-1-07)**	**Assessment Method Summary**
E. coli	Seasonal geometric mean *E. coli* content* based on samples from the recreation season within a calendar year is 126 cfu/100 mL; single sample maximum is 235 cfu/100 mL.	Applied to the three Lake Erie assessment units, exceedance of the geometric mean bathing water criterion or an exceedance of the single sample maximum for more than 10 percent of the recreation season is considered an impairment of the bathing water use.
Primary Contact and Secondary Contact		
Indicator	**Criterion (Table 7-13, OAC 3745-1-07)**	**Assessment Method Summary**
E. coli	Seasonal geometric mean *E. coli* content* based on samples from the recreation season within a calendar year is as follows: Primary Contact Waters Class A: 126 cfu/100 mL Class B: 161 cfu/100 mL Class C: 206 cfu/100 mL Secondary Contact Waters All:1030 cfu/100 mL	Applied to streams and inland lakes. Data from a recreation season are assessed on a site-by-site basis and compared to the applicable geometric mean *E. coli* criterion whenever more than one sample result is available for a WAU. Assessment units (AUs) are considered to be in full attainment if all sites assessed within the AU meet the applicable geometric mean criterion and in non-attainment if one or more sites assessed within the AU exceed the applicable geometric mean criterion.

**E. coli* concentrations are expressed in colony forming units (cfu) per 100 milliliters (mL)

F2. Evaluation Method

Lake Erie (Shoreline)
Attainment of the RU designation for the three Lake Erie assessment units (LEAUs) was based upon examination of *E. coli* data from public bathing beaches provided by the Ohio Department of Health (ODH). Routine bacteria monitoring is performed by local health districts, ODH and the Northeast Ohio Regional Sewer District (NEORSD) in order to monitor bacteria levels at public bathing beaches and advise the public when elevated bacteria are present that represent an increased risk of contracting waterborne illness as a result of exposure to pathogens while recreating in the water. This monitoring takes place at 65 public beaches in eight coastal counties. The public can access the ODH Beachguard website to view beach advisory postings and bacteria monitoring data from monitored beaches at http://publicapps.odh.ohio.gov/BeachGuardPublic/Default.aspx. The website is updated daily during the summer recreation season.

Since 2006, beach advisory recommendations have been based upon exceedance of the single sample maximum *E. coli* criterion of 235 cfu/100 mL, consistent with provisions of the 2004 federal Beaches Environmental Assessment and Coastal Health (BEACH) Act rule as well as the *E. coli* criterion applicable for bathing waters in Ohio's water quality standards. Bacteria data collected by local or state health agencies at public beaches during the recreation season from 2011 through 2015 were included in the analysis. Ohio's water quality standards define the recreation season as May 1 through October 31, though Lake Erie beach monitoring typically is focused between the Memorial Day and Labor Day weekends.

Each of the 22 public beaches that have traditionally been sampled as part of the Lake Erie bathing beach monitoring program (Figure F-1) was individually analyzed to evaluate the percentage of recreation days during which the bathing water single sample maximum criterion of 235 cfu/100 mL was exceeded, since this is the criterion used by health departments to post a health advisory at a given beach. The frequency of beach advisory postings is a direct measure of RU impairment, since potential users may often be discouraged from utilizing a beach on days when a health advisory is posted or to avoid certain beaches altogether that are prone to frequent advisories. The locations of beaches in Erie and Sandusky Counties are depicted in Figure F-2, while those beaches located in Cuyahoga and Lorain Counties are depicted in Figure F-3.

As of October 1, 2013, there were 169 public access locations in the eight coastal counties along Ohio's Lake Erie coastline. These public access points do not all include a swimming beach, as some are for boat access, fishing access, parks, wildlife viewing areas, etc. The Ohio Department of Natural Resources (ODNR) publishes a Lake Erie Public Access Guide that can be accessed from this web address: http://coastal.ohiodnr.gov/gocoast. This report used data collected from 65 different beaches along the coast as depicted in Figures F-1 through F-3.

The total number of recreation days in a recreation season for any particular beach was determined by adding the number of days beginning with the first day of sampling and ending with Labor Day, or the date the final sample was collected (whichever was later). The total number of days that a beach exceeded the single sample maximum *E. coli* criterion of 235 cfu/100 mL during the recreation season (as defined above) was tallied. A measured exceedance was assumed to continue until a subsequent sample documented that the criterion was not exceeded. Similarly, a beach was presumed to meet the criterion following a measurement that met the criterion until a subsequent sample was found to

exceed the criterion. Sampling frequency varied from year-to-year and from beach-to-beach. A sampling frequency of four times per week was typical, though some beaches were sampled daily while the two beaches in the Lake Erie Islands AU were sampled only once per week.

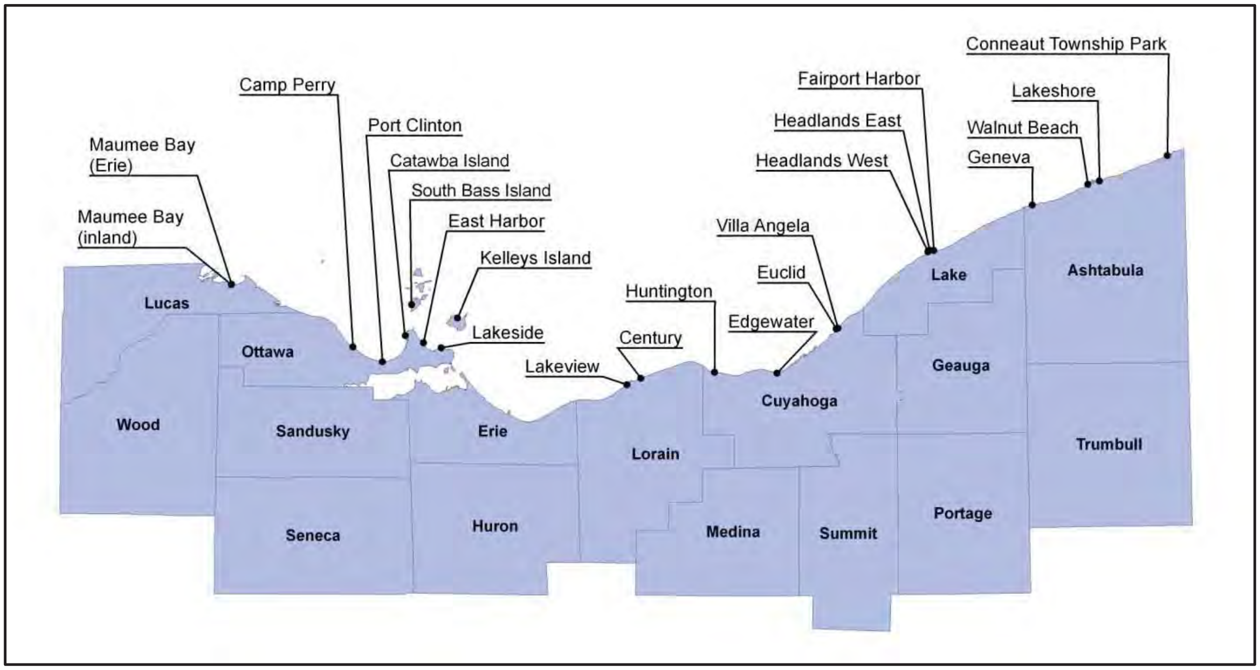


Figure F-1. Lake Erie public beaches sampled under Ohio's bathing beach monitoring program.

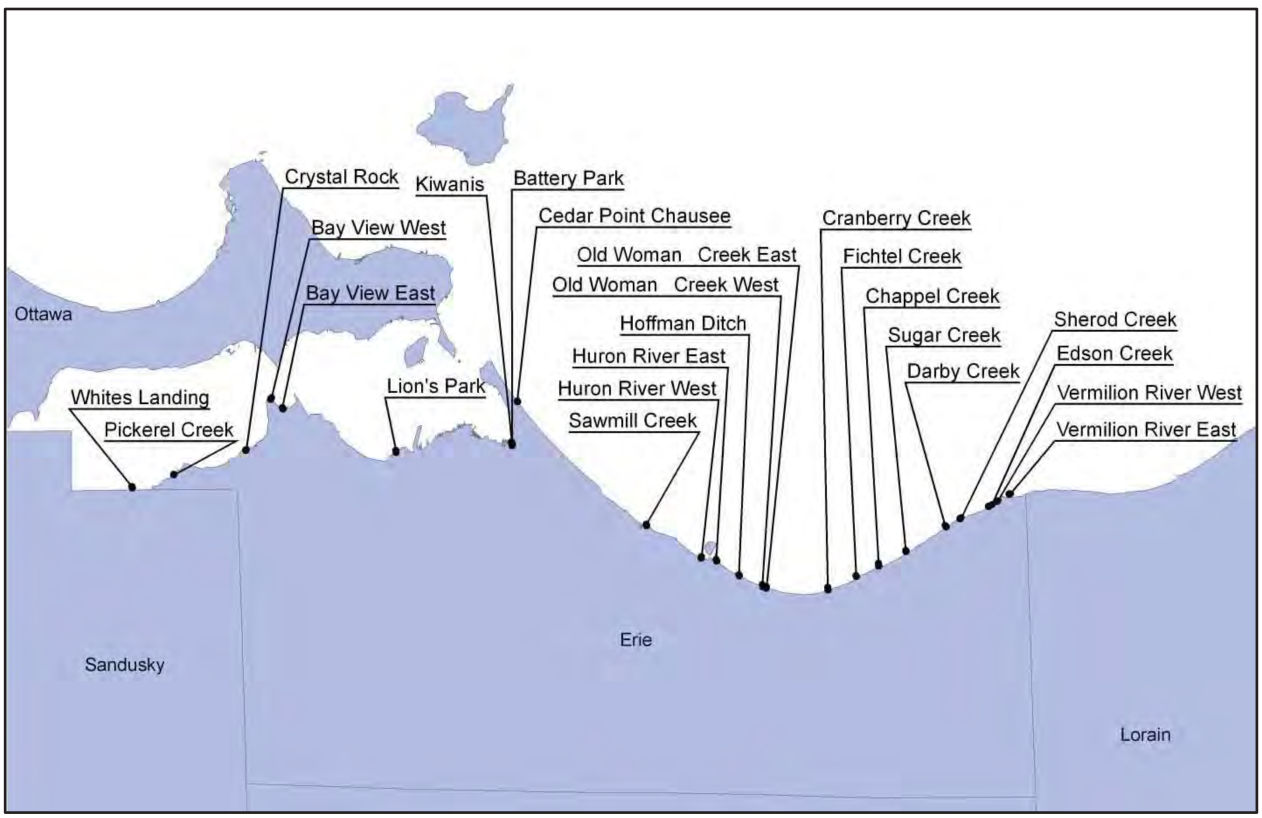


Figure F-2. Erie and Sandusky County public beaches sampled under Ohio's bathing beach monitoring program.

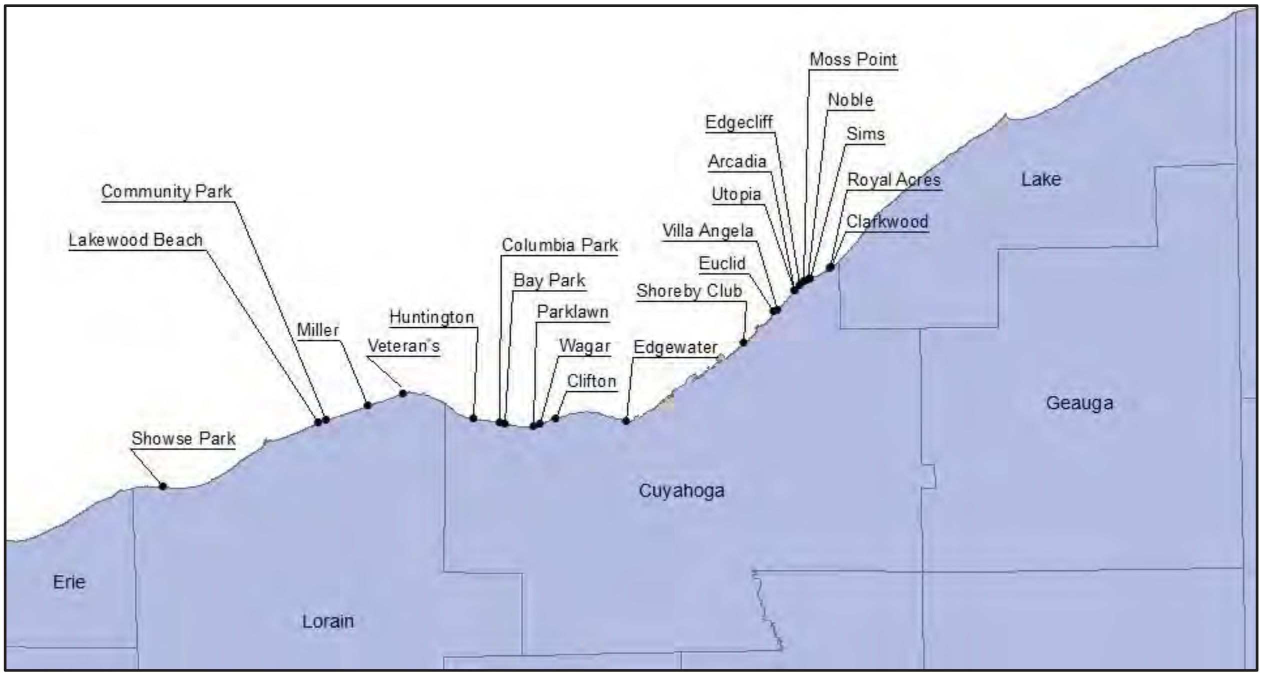


Figure F-3. Cuyahoga and Lorain County public beaches sampled under Ohio's bathing beach monitoring program.

The exceedance frequency of the bathing water criterion was determined for each beach over a five-year period (2011-2015) on an annual basis. Results for each individual beach were sorted into the corresponding LEAU for the purpose of determining the attainment status of each of the three LEAUs. The assessment status for each LEAU was based upon whether the frequency of exceedance of the single sample maximum *E. coli* criterion was greater than 10 percent of the recreation season, as described in the Table F-2 below.

Table F-2. Determining assessment status of Lake Erie shoreline AUs.

LEAU Status	Attainment Status of Individual Beaches
Full	Frequency of advisory postings less than 10 percent of recreation season for all of the beaches in the AU for all years assessed
Non	Frequency of advisory postings more than 10 percent of recreation season for one or more of the beaches in the AU for one or more of the years assessed

A 10 percent exceedance frequency was used as the threshold for attainment determination in the last five assessment cycles and has its origins in the water quality standards as well as Ohio's 1998 State of the Lake Report prepared by the Ohio Lake Erie Commission (Ohio LEC 1998). While the stated goal in the State of the Lake report for beaches is to have clean beaches all of the time (no days under advisement), the report considered having ten or fewer days under advisement to be "excellent" (note that ten days translates to 10 percent of the season based on a 100-day season). The Ohio Lake Erie Commission's latest edition of the State of the Lake Report (Ohio LEC 2004) continues to use these benchmarks in rating the swimmability of Lake Erie beaches along Ohio's 312-mile shoreline. The 2016 IR also continues to use these criteria in determination of impairment at the assessment unit level. In addition, statistical summaries are included in Tables F-5 and F-6 for individual beaches to provide more detail and allow performance comparisons among individual beaches.

Rivers and Streams

The 2016 RU impairment list was developed using ambient *E. coli* survey data collected from May 2011 through October 2015 by Ohio EPA as well as from ambient stream data provided by municipal dischargers that were collected at upstream and downstream monitoring stations relative to their primary discharge location as required by their National Pollutant Discharge Elimination System (NPDES) permit and reported in the Surface Water Information Management System (SWIMS) database. *E. coli* data from dischargers, while previously limited in quantity since permits had historically been based on monitoring for fecal coliform, has become more numerous as *E. coli* monitoring has replaced fecal coliform monitoring in most NPDES permits.

Approximately 18,400 *E. coli* bacteria records were evaluated in this analysis. Data were sorted into their respective 12-digit WAUs and large river assessment units (LRAUs) using a geo-spatial analysis of the latitude/longitude data (and other geographical data if needed) associated with each *E. coli* value. Data within a WAU were further sorted by sampling location and date (calendar year) on which they were collected. Figure F-4 demonstrates the sampling coverage that would be typical for part of a study area. In this case, there are five 12-digit WAUs depicted that drain to one LRAU, the Walhonding River. Each of the five WAUs was sampled in 2010 at one location (depicted by yellow dots) toward the downstream end of the primary tributary in the WAU. Four sampling locations (green dots) are dispersed along the 16-mile stretch of the Walhonding River depicted for an average sampling density of one site per four miles of river length for the Class A primary contact recreation water. Sites were generally sampled at least on five different occasions over the course the 2010 recreation season, though some sites were sampled more frequently.

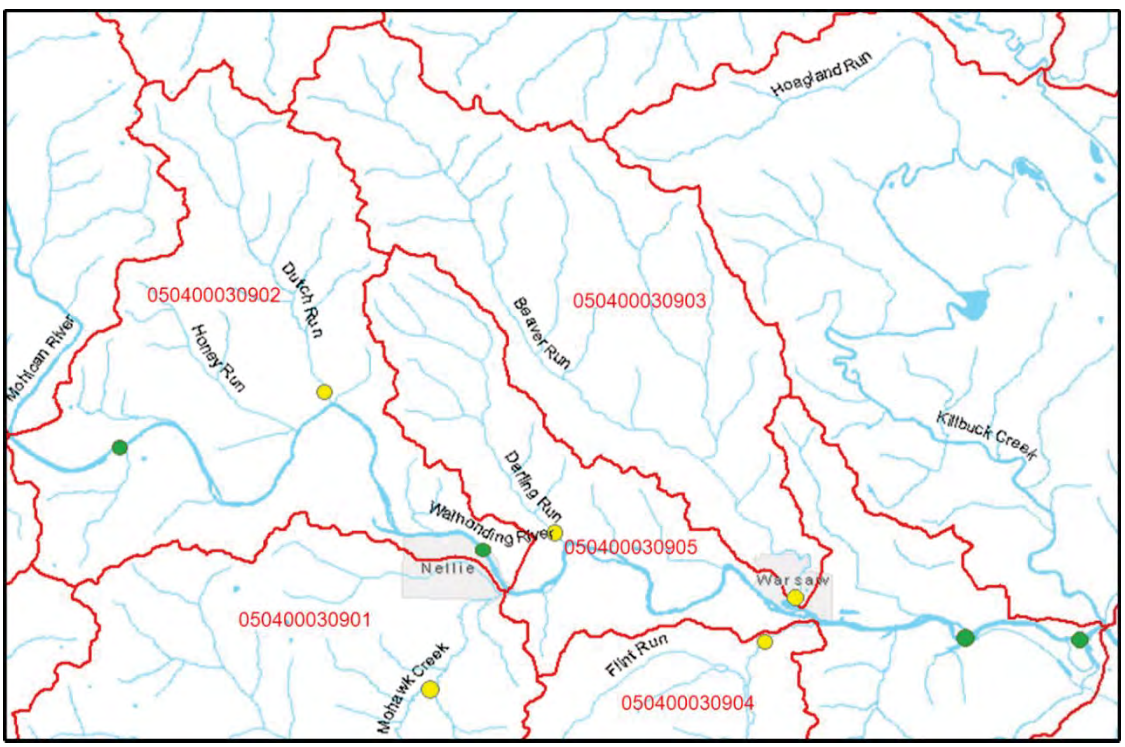


Figure F-4. Example of bacteria sampling locations, upper Walhonding River study area (2010).

RU assessment determinations for rivers and streams are based on the following two-step process: site-by-site analysis and assessment unit analysis.

Site-by-Site Analysis

E. coli data from each site were compared to the geometric mean *E. coli* criterion applicable to the particular site, considering the RU and class (for primary contact recreation or PCR). The geometric mean was calculated using the "geomean" function in Microsoft Excel 2010® on a site-by-site basis using the pooled dataset of all *E. coli* data (minimum of two data points required but typically composed of five samples) from the site during a single recreation season. When data were available for multiple recreation seasons, the data from each season were independently analyzed for each recreation season to determine the geometric mean for each season. Further details are listed as follows:

- Data collected outside of the recreation season as defined in Ohio's WQS (May 1st through October 31st) were excluded from the analysis.
- Certain qualified values, such as sample results that exceeded proper holding time or those that have otherwise been indicated to have significant quality assurance deficiencies, were also excluded from the analysis.
- Values reported as "too numerous to count" ("TNTC") were used in the analysis when it was possible to estimate a value based on the dilutions used and/or the maximum reporting limits.
- Values reported as "greater than" were also used in the analysis. A geometric mean calculated using one or more "greater than" or "TNTC" values in the data set was reported as a "greater than" geometric mean.
- Values reported as "less than" values of greater than 50 were excluded since acceptable test methods can detect much lower concentrations when appropriate dilutions are used in the analysis. Values reported as 50 or less were used in the analysis. The value used in statistical analysis was one-half the reported "less than" value. A value of one was substituted for the purpose of computing the geometric mean in any case where a value of less than one was reported. Geometric means cannot be calculated using data sets that contain a value of zero.
- Results from duplicate B were used for calculation of the geometric mean in cases where duplicate sample results were reported, except if the *E. coli* densities of the duplicate samples were more than five times apart from one another, in which case both values were rejected.

Assessment Unit Analysis

In the second step of the analysis, the assessment status of the WAU or LRAU was determined based on the attainment status of all the individual sites within the assessment unit and within the assessment period (2011-2015) as described in Table F-3 below.

Table F-3. Determining assessment status of WAUs and LRAUs.

AU Assessment Status	Attainment Status of Individual Locations
Full (Category 1)	Sufficient data exist to calculate a geometric mean for at least one location within the WAU (or a minimum of one site for every ~5-7 river miles of a LRAU); applicable geometric mean(s) attain applicable geometric mean criterion at all assessed sites within the AU
Non (Category 5)	Sufficient data exist to calculate a geometric mean for at least one location within the WAU (or a minimum of one site for every ~5-7 river miles of a LRAU); geometric mean(s) exceed applicable geometric mean criterion at one or more assessed sites within the AU
Insufficient Data (Category 3)	No data (category 3) or insufficient data (category 3i) to calculate a geometric mean for any site within the WAU (or for a minimum of one site for every ~5-7 river miles of a LRAU)

Inland Lakes

Inland lakes were assessed in a manner similar to that described above for the rivers and streams. Inland lake data were analyzed on a site-by-site basis, with each resulting geometric mean value compared to the geometric mean criterion applicable to each site. Lake sampling locations generally included a beach and/or open water location, with five to ten samples per location. Inland lakes are considered a component of the assessment unit(s) in which they are geographically located, so sample results from lakes may affect the assessment status of the AU(s) and the index scores for the AU(s).

ODNR, as part of Ohio's Bathing Beach Monitoring Program, monitors *E. coli* levels during the summer at public beaches of lakes located in state parks. While Ohio EPA was unable to establish the level of credibility of these data for use in official listing determinations for this report, a summary of the advisory postings for the 68 beaches monitored in the program is included in Table F-17. Though similar to the beach monitoring program along Lake Erie, there are several differences. Notably, the sampling frequency is much lower at the inland lake beaches compared to the Lake Erie beaches as a result of funding disparity. Secondly, because of the large geographic area, beach samples from inland lakes are analyzed by a multitude of consulting laboratories across the state.

RU Attainment Index Score

The RU attainment index score provides a way to compare the relative difference between the *E. coli* concentrations at sites sampled within an assessment unit and the RU geometric mean criterion that applies to each of the sampled sites. Those assessment units having *E. coli* concentrations that tended to be much greater than the applicable criteria had the lowest scores, while those assessment units having *E. coli* concentrations that attained the applicable criteria, or tended to only slightly exceed the applicable criteria, had the highest scores. An index score was assigned for each site having sufficient data to calculate a geometric mean (i.e., two or more samples) by comparing the geometric mean *E. coli* concentration at the site to the applicable geometric mean criterion based on the scale depicted in Table F-4.

Table F-4. Recreation index score matrix.

Site Geometric Mean	Index Score
Meets criterion	100
Exceeds up to 2x criterion	75
Exceeds more than 2x up to 5x criterion	50
Exceeds more than 5x up to 10x criterion	25
Exceeds more than 10x criterion	0

An average index score was computed for assessment units with multiple site index scores based on data from multiple sites and/or recreation seasons. Index scores are reported in Table F-11 for the LRAUs. When only one site index score was available for an AU, that index score was used to represent the assessment unit. The index score for the AU is based upon the same scale as described above for the index score for a particular site.

F3. Results

Using the methodology outlined in the previous section and available *E. coli* data collected from 65 public beaches along Ohio's Lake Erie 312-mile shoreline (14,294 samples); at hundreds of locations from Ohio's rivers and streams (11,450 samples) including nine of Ohio's largest rivers; and for 21 of Ohio's inland lakes (240 samples) results for the RU attainment analysis are presented in this section.

Samples used in this analysis were collected from 2011 through 2015 during the recreation season of May 1 through October 31.

F3.1 Lake Erie Public Beaches

Information about water quality conditions at Lake Erie public bathing beaches is summarized in Tables F-5 through F-8 and Figure F-5. The location of these beaches is shown in Figures F-1 through F-3. The methodology used for assessing the beaches along Ohio's Lake Erie shoreline is unchanged from the 2010, 2012 and 2014 reports.

Table F-5 contains the seasonal geometric mean *E. coli* levels for 17 public beaches along the coast of Lake Erie's western basin for the past five recreational seasons (2011-2015) while Table F-6 contains the seasonal geometric mean *E. coli* levels for 48 public beaches along the coast of Lake Erie's central basin for the past five recreational seasons (2011-2015).

The seasonal geometric mean *E. coli* criterion for bathing waters was exceeded at fourteen beaches in 2011, thirteen beaches in 2012, twenty-two beaches in 2013, eighteen beaches in 2014 and fifteen beaches in 2015. Six beaches exceeded the seasonal geometric mean bathing water criterion for the entire five year reporting period – Arcadia, Bay View West, Euclid State Park, Lakeshore Park, Lakeview and Villa Angela. Not surprisingly, these beaches had among the most days under a swimming advisory during the 2011-2015 reporting period. Highlighted cells in Table F-5 indicate impairment of the RU at a given beach in a given year. The table also indicates the number of beach advisories for each beach based upon exceedance of the single sample maximum *E. coli* criterion for beaches of 235 cfu/100 mL. This is the threshold that triggers the issuance of beach advisories and has been used since 2006. Use of the single sample maximum *E. coli* criterion for the purpose of issuing beach advisories complies with the federal Beaches Environmental Assessment and Coastal Health (BEACH) Act rule (*Water Quality Standards for Coastal and Great Lakes Recreation Waters*, 69 FR 67217, November 16, 2004), which became effective on December 16, 2004.

In Tables F-7 through F-9, the beaches are arranged alphabetically according to the LEAU in which they are geographically located. The table indicates the number of days (and the percentage for all years) when Ohio's Lake Erie public beaches exceeded Ohio's bathing water single sample maximum criterion compared to the total number of days in the recreation season sampling period.

As depicted in Figure F-5, the frequency with which individual beaches were recommended for a swimming advisory based on elevated bacteria levels above the state water quality standards for the entire five year reporting period (2011-2015) ranged from near zero at South Bass Island State Park and Battery Park beach to nearly 40 percent or more at Arcadia, Bay View West, Edson Creek, Euclid State Park, Lakeshore Park, Lakeview, Sherod and Villa Angela State Park beaches. Considerable variation in the frequency of advisories was observed between beaches and from season-to-season at many beaches. However, several beaches stand out as consistently good performers over the past several recreation seasons, including Battery Park, Bay Park, Catawba Island, Conneaut, East Harbor State Park, Kelleys Island, Lakeside and South Bass Island State Park, which all had a cumulative exceedance frequency under 10 percent. These beaches infrequently exceeded the goal of fewer than 10 days per season under advisement. There were also several beaches that performed consistently poor with four beaches including Bay view East, Edson Creek, Lakeview and Villa Angela beach under advisement approaching or over 50 percent of the time during the past five recreation seasons on a cumulative basis. High variation in bacteria levels was also seen between seasons for some beaches. For example,

Cranberry beach was under advisement for just six days in 2012, but under advisement for 34 days in 2013. Fichtel beach was under advisory eight days in 2012, but was under advisory for 32 days in 2013. The annual median number of days under advisement for all beaches by calendar year was highest in 2013 at 28 days compared to the rest of the reporting years, which had a median number of days under advisory ranging from 17-22 on an annual basis. The annual average geometric mean *E. coli* level for all beaches by year within this reporting cycle ranged from a low of 80.7 in 2011 to a high of 112.0 in 2014.

Impairment of the bathing water RU was determined by pooling data from beaches in each of the three LEAUs and calculating the percentage of days in the recreational season when the *E. coli* criterion was exceeded. A threshold of impairment was set at 10 days per season based upon the Ohio Lake Erie Commission's evaluation system (Ohio LEC 1998). This translates to a seasonal exceedance frequency of 10 percent, as the recreation season at Lake Erie's beaches in Ohio typically runs from Memorial Day weekend through Labor Day weekend. Results are shown in Table F-10. As in previous assessment cycles, the 2016 assessment results indicate that the Lake Erie Islands assessment unit fully supports the RU while the western basin and central basin assessment units do not support the RU. The overall total recreation days in exceedance of the bathing waters criterion on a percentage basis was 15.9 percent in the western basin (15 beaches) and 25.8 percent (48 beaches) in the central basin compared to just 3.1 percent for the Lake Erie Islands (two beaches).

Table F-5. Seasonal geometric mean *E. coli* levels and advisory postings at public Lake Erie shoreline beaches in the western basin.

Beach	2011		2012		2013		2014		2015	
	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted
Battery Park	11	5	10	0	8	5	5	0	11	4
Bay View East	52	9	128	23	168	35	212	57	94	21
Bay View West	184	39	288	52	367	62	205	57	142	42
Camp Perry	200	16	481	48	42	9	155	14	84	26
Catawba Island	28	3	50	4	13	0	22	9	47	11
Crystal Rock	42	14	53	17	38	9	42	10	43	18
East Harbor	39	8	62	12	13	5	13	0	10	5
Kelleys Island	13	0	28	3	63	14	43	6	36	0
Kiwanis	67	7	108	24	145	25	98	20	141	44
Lakeside	12	5	8	0	17	4	15	1	12	7
Lion’s Park	53	19	60	23	123	31	97	19	54	12
Maumee - Erie	50	16	65	22	97	35	105	40	167	45
Maumee - Inland	18	5	41	15	47	11	87	15	92	27
Pickerel Creek	45	18	83	18	53	12	36	10	68	24
Port Clinton	127	37	156	36	96	30	28	17	48	32
South Bass Island	5	0	7	0	10	4	6	0	7	2
Whites Landing	91	21	188	33	362	57	158	36	158	45

Shaded cells indicate impairment of the RU. Impairment is triggered by an exceedance of the geometric mean criterion on a seasonal basis *(seasonal geomean)* or if the single-sample maximum criteria *(SSM)* are exceeded more than 10 percent of the time during a season. The beach season is defined for this analysis as the time *E. coli* monitoring commences, typically in late May though the end of the Labor Day weekend. The number of days posted is determined by counting the number of days a criterion is exceeded. Days for which no monitoring data were collected are presumed to be in exceedance if the preceding day’s bacteria level exceeded the criteria. Unmonitored days are presumed to meet the criteria when preceded by a monitored day that was below the criterion.

Table F-6. Seasonal geometric mean *E. coli* levels and advisory postings at public Lake Erie shoreline beaches in the central basin.

Beach	2011		2012		2013		2014		2015	
	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted
Arcadia	189	30	362	56	141	34	209	34	279	39
Bay Park	25	13	42	7	31	14	40	2	59	13
Cedar Point	28	18	32	6	40	14	25	14	35	8
Century	44	18	45	14	36	15	61	33	110	34
Chappel Creek	47	23	16	12	137	46	160	50	110	27
Clarkwood	179	25	115	28	258	45	106	16	117	22
Clifton	81	24	100	28	67	25	112	28	49	22
Columbia Park	44	3	153	28	60	9	68	11	105	20
Community Park							105	41	108	29
Conneaut	29	14	20	3	52	21	32	8	24	3
Cranberry	17	9	18	6	54	34	40	28	39	20
Darby	111	32	33	13	182	40	242	66	86	30
Edgecliff	269	45	110	28	147	20	203	37	288	37
Edgewater	85	29	48	12	58	17	52	17	80	22
Edson	205	49	56	29	207	54	580	78	193	56
Euclid State Park	158	48	149	42	231	51	131	32	152	42
Fairport Harbor	57	18	66	18	83	26	77	23	96	28
Fichtel Creek	30	14	19	8	64	32	37	17	34	15
Geneva State Park	43	13	20	5	64	27	43	16	29	3
Headlands East	43	12	46	13	59	29	49	12	53	18
Headlands West	39	15	31	12	56	24	49	12	56	18
Hoffman Ditch	23	5	24	8	87	24	61	26	60	25
Huntington	62	13	54	11	71	26	52	34	68	30
Huron River East	51	14	43	16	72	29	62	18	57	28
Huron River West	96	40	70	15	119	46	102	38	161	28
Lakeshore Park	130	44	142	45	263	55	197	50	228	33
Lakeview	260	50	271	51	473	70	394	78	248	65
Lakewood Park							92	33	84	25

Beach	2011		2012		2013		2014		2015	
	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted	Seasonal geomean	number of days posted
Miller Beach			42	4						
Moss Point	182	34	108	40	140	33	200	30	113	21
Noble	98	30	91	28	131	35	296	37	96	25
Old Woman East	20	7	21	3	32	26	28	15	27	15
Old Woman West	17	2	20	5	59	26	72	24	56	24
Parklawn	49	19	38	21	42	9	46	6	47	9
Royal Acres	190	22	136	28	236	46	124	11	104	13
Sawmill Creek	61	5	55	18	72	30	34	17	42	11
Sherod Creek	114	36	75	27	156	41	217	65	89	49
Shoreby Club	88	26	48	21	68	14	77	9	90	14
Showse	37	22	17	11	62	32	73	33	44	24
Sims	150	34	111	28	214	52	328	32	184	32
Sugar Creek	69	28	28	13	180	58	104	52	60	30
Utopia	74	17	186	42	77	22	104	14	235	34
Vermilion East	47	20	45	18	129	39	109	41	65	26
Vermilion West	66	26	52	16	192	45	192	49	143	46
Veteran's Beach			40	15						
Villa Angela	195	57	127	44	231	55	160	40	231	54
Wagar	65	9	110	37	56	14	44	2	65	16
Walnut	16	14	29	8	29	11	32	15	16	14

Empty cells indicate no data were available for the beach during that year. Highlighted cells indicate impairment of the RU. Impairment is triggered by an exceedance of the geometric mean criterion on a seasonal basis *(seasonal geomean)* or if the single-sample maximum criteria *(SSM)* are exceeded more than 10 percent of the time during a season. The beach season is defined for this analysis as the time *E. coli* monitoring commences, typically in late May, though the end of the Labor Day weekend. The number of days posted is determined by counting the number of days a criteria is exceeded. Days for which no monitoring data were collected are presumed to be in exceedance if the preceding day's bacteria level exceeded the criteria. Unmonitored days are presumed to be below the criteria when preceded by a monitored day that was below the criterion.

Table F-7. The number of days per season (and the percentage for all years) when Ohio Lake Erie public beaches exceeded Ohio's single sample maximum *E. coli* criterion compared to the total number of days in the sampling period, 2011 – 2015, for the Central Basin AU.

Beach	2011	2012	2013	2014	2015	All years (%)
Arcadia Beach	30/97	56/97	34/97	34/97	39/104	193/492 (39.2%)
Bay Park Beach	13/98	7/97	14/98	2/98	13/105	49/496 (9.9%)
Cedar Point Chausee	18/98	6/98	14/98	14/106	8/113	60/513 (11.7%)
Century Beach	18/98	14/97	15/98	33/106	34/113	114/512 (22.3%)
Chappel Creek	23/98	12/98	46/98	50/106	27/113	158/513 (30.8%)
Clarkwood Beach	25/97	28/97	45/97	16/96	22/104	136/491 (27.7%)
Clifton Beach	24/98	28/97	25/98	28/98	22/105	127/496 (25.6%)
Columbia Park Beach	3/98	28/97	9/98	11/98	20/105	71/496 (14.3%)
Community Park Beach				41/106	29/113	70/219 (32.0%)
Conneaut Township Park	14/98	3/78	21/98	8/102	3/92	49/468 (10.5%)
Cranberry Creek	9/98	6/98	34/98	28/106	20/113	97/513 (18.9%)
Darby Creek	32/98	13/98	40/98	66/106	30/113	181/513 (35.3%)
Edgecliff Beach	45/97	28/97	20/97	37/97	37/104	167/492 (33.9%)
Edgewater State Park	29/111	12/106	17/104	17/106	22/109	97/536 (18.1%)
Edson Creek	49/98	29/98	54/98	78/106	56/113	266/513 (51.9%)
Euclid State Park	48/112	42/106	51/104	32/106	42/109	215/537 (40.0%)
Fairport Harbor	18/99	18/106	26/100	23/102	28/112	113/519 (21.8%)
Fichtel Creek	14/98	8/98	32/98	17/106	15/113	86/513 (16.8%)
Geneva State Park	13/98	5/106	27/98	16/106	3/92	64/496 (12.9%)
Headlands State Park East	12/99	13/106	29/100	12/102	18/112	84/519 (16.2%)
Headlands State Park West	15/99	12/106	24/100	12/102	18/113	81/520 (15.6%)
Hoffman Ditch	5/98	8/98	24/98	26/106	25/113	88/513 (17.2%)
Huntington Beach	13/106	11/108	26/116	34/106	30/113	114/549 (20.8%)
Huron River East	14/98	16/98	29/98	18/106	28/113	105/513 (20.5%)
Huron River West	40/98	15/98	46/98	38/106	28/113	167/513 (32.6%)
Lakeshore Park	44/98	45/108	55/98	50/102	33/92	227/498 (45.6%)
Lakeview Beach	50/98	51/98	70/99	78/106	65/113	314/514 (61.1%)
Lakewood Beach				33/106	28/113	61/219 (27.9%)
Miller Beach		4/98				4/98 (4.1%)
Moss Point Beach	34/97	40/97	33/97	30/97	21/104	158/492 (32.1%)
Noble Beach	30/97	28/97	35/97	37/97	25/104	155/492 (31.5%)
Old Woman Creek East	7/98	3/98	26/98	15/106	15/113	66/513 (12.9%)
Old Woman Creek West	2/98	5/98	26/98	24/106	24/113	81/513 (15.8%)
Parklawn Beach	19/98	21/97	9/98	6/97	9/105	64/495 (12.9%)
Royal Acres Beach	22/97	28/97	46/97	11/97	13/104	120/492 (24.4%)
Sawmill Creek	5/98	18/98	30/98	17/106	11/113	81/513 (15.8%)
Sherod Creek	36/98	27/98	41/98	65/106	49/113	218/513 (42.5%)
Shoreby Club Beach	26/97	21/97	14/97	9/97	14/104	84/492 (17.1%)
Showse Park	22/98	11/98	32/98	33/106	24/113	122/513 (23.8%)
Sims Beach	34/97	28/97	52/97	32/97	32/104	178/492 (36.2%)
Sugar Creek	28/98	13/98	58/98	52/106	30/113	181/513 (35.3%)

Beach	2011	2012	2013	2014	2015	All years (%)
Utopia Beach	17/97	42/97	22/97	14/97	34/104	129/492 (26.2%)
Vermilion River East	20/98	18/98	39/98	41/106	26/113	144/513 (28.1%)
Vermilion River West	26/98	16/98	45/98	49/106	46/113	182/513 (35.5%)
Veteran's Beach		15/98				15/98 (15.3%)
Villa Angela State Park	57/112	44/106	55/104	40/106	54/109	250/537 (46.6%)
Wagar Beach	9/98	37/97	14/98	2/98	16/105	78/496 (15.7%)
Walnut Beach	14/98	8/106	11/98	15/102	14/92	62/496 (12.5%)

Table F-8. The number of days per season (and the percentage for all years) when Ohio Lake Erie public beaches exceeded Ohio's single sample maximum *E. coli* criterion compared to the total number of days in the sampling period, 2011 – 2015, for the Islands AU.

Beach	2011	2012	2013	2014	2015	All years (%)
Kelleys Island State Park	0/78	3/85	14/84	6/106	0/111	23/464 (5.0%)
South Bass Island State Park	0/78	0/85	4/84	0/106	2/113	6/466 (1.3%)

Table F-9. The number of days per season (and the percentage for all years) when Ohio Lake Erie public beaches exceeded Ohio's single sample maximum *E. coli* criterion compared to the total number of days in the sampling period, 2011 – 2015, for the Western Basin AU.

Beach	2011	2012	2013	2014	2015	All years (%)
Battery Park	5/98	0/98	5/98	0/106	4/113	14/513 (2.7%)
Bay View East	9/98	23/98	35/97	57/106	21/113	145/512 (28.3%)
Bay View West	39/98	52/98	62/97	57/106	42/113	252/512 (49.2%)
Camp Perry	16/78	48/89	9/84	14/64	26/113	113/428 (26.4%)
Catawba Island State Park	3/78	4/89	0/84	9/106	11/113	27/470 (5.7%)
Crystal Rock	14/98	17/98	9/98	10/106	18/113	68/513 (13.3%)
East Harbor State Park	4/78	12/91	5/84	0/106	5/113	30/472 (6.4%)
Kiwanis	7/98	24/98	25/98	20/106	44/113	120/513 (23.4%)
Lakeside	5/78	0/91	4/84	1/106	7/113	17/472 (3.6%)
Lion's Park	19/98	23/98	31/98	19/106	12/113	104/513 (20.3%)
Maumee Bay State Park (inland)	5/85	15/106	11/98	15/98	28/105	74/492 (15.0%)
Maumee Bay State Park (Erie)	16/85	22/106	35/98	40/98	45/105	158/492 (32.1%)
Pickerel Creek	18/98	18/98	12/98	10/106	24/113	82/513 (16.0%)
Port Clinton	37/78	36/91	30/84	17/106	32/113	152/472 (32.2%)
Whites Landing	22/98	33/98	57/98	36/106	45/113	193/513 (37.6%)

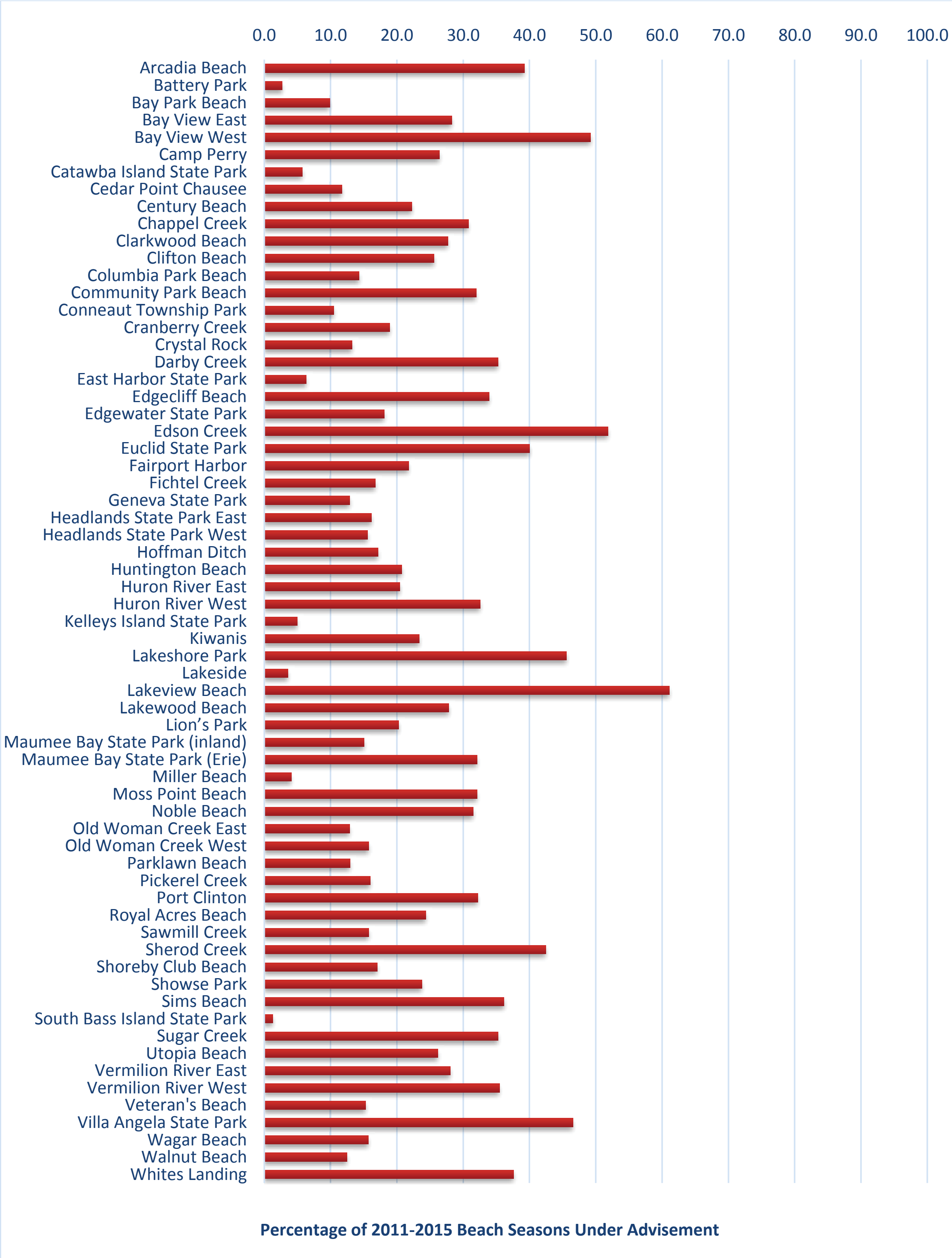


Figure F-5. Frequency of advisory postings at Ohio's Lake Erie public beaches.

Table F-10. Bathing water geometric mean *E. coli* exceedance frequency at 65 Lake Erie public beaches from 2011-2015 (pooled by LEAU to report use support).

	Western Basin	Central Basin	Lake Erie Islands
Number of beaches	15	48	2
Total recreation days	7,400	22,962	930
Total days in exceedance	1,549	5,926	29
Percentage of days in exceedance	15.9%	25.8%	3.1%
Average # of days *E. coli* criteria exceeded per beach per season[1]	20.9	26.2	1.0
Attainment status	Does not support	Does not support	Full support

[1]Calculated by dividing the total days in exceedance in the basin by the total number of beach seasons in the basin. The total number of beach seasons in a basin is equal to aggregated sum of the total number of beaches for which monitoring was conducted during each season for the 2011-2015 reporting period.

F3.2 Rivers and Streams

Approximately 18,400 bacteria measurements were evaluated for the 2016 RU support analysis of streams, rivers and inland lakes in Ohio. Ohio's RU support analysis is based on an examination of *E. coli* data collected in Ohio's rivers, streams and inland lakes during the recreation season.

While the majority of the *E. coli* data used in previous assessment reports were collected by Ohio EPA, this is the first report in which the majority of the data used in the analysis has come from discharger generated data. This is a result of the transition from fecal coliform monitoring requirements to *E. coli* monitoring requirements in NPDES permits following the adoption of *E.coli* criteria in place of fecal coliform criteria in Ohio's water quality standards in 2009. While few facilities were monitoring for *E. coli* shortly following the revised criteria, most facilities are now measuring and reporting *E. coli* values following the expiration of permit compliance schedules. As expected, the amount of data from NPDES sources has grown substantially. In this report, approximately 60 percent of the data are from NPDES dischargers while the remaining 40 percent was generated by Ohio EPA.

Table F-11 provides a summary of Ohio EPA's RU monitoring effort and its translation to use assessment annually for the past five recreation seasons.

Table F-11. Annual Ohio EPA *E. coli* sampling effort and RU assessment (using Ohio EPA data) in Ohio streams, rivers and inland lakes, 2011-2015 recreation seasons.

	2011	2012	2013	2014	2015
number of samples collected by Ohio EPA	1,674	1,173	1,635	1,423	1,231
number of site geometric means computed	276	219	269	222	219
number of unique WAUs assessed	130	92	131	121	115
number of unique LRAUs assessed	3	5	2	1	0

The *E. coli* data used in this report from Ohio EPA was typically collected as part of routine ambient monitoring associated with annual drainage basin surveys conducted around the state. Using the methodology described in Section F2, it was possible to determine the RU attainment status of 697 of the 1,538 (45 percent) WAUs in Ohio based on current data (2011-2015). This figure includes those WAUs in which data were collected between 2011 and 2015, regardless of the category of the AU. Ohio has completed total maximum daily loads (TMDLs) for bacteria in 448 of the 1,538 WAUs in Ohio (29 percent).

On an annual basis, Ohio's current effort typically allows the state to assess the RU of less than 10 percent of the WAUs in the state using data collected by Ohio EPA. At this rate, the maximum current assessment information that will be possible at any given time using Ohio EPA-generated data will be for about half of the state's WAUs, assuming that there is no assessment duplication within any given WAU during any five-year data period and the sampling effort is limited to the minimal amount needed per WAU to make an assessment determination as described in Section F2.

Table F-12. Overall differences in the assessment of RU attainment, 2010-2016.

	2010 Report		2012 Report		2014 Report		2016 Report	
	Number	Percent	Number	Number	Number	Percent	Number	Percent
total AUs	1,576	100	1,576	100	1,576	100	1,576	100
assessed	487	31	588	37	680	43	713	45
not assessed	1,089	69	988	63	896	57	863	55
supporting use[a]	65	13	88	15	130	19	73	10
not supporting use[a]	422	87	500	85	550	81	640	90

[a] Note: The percentage of AUs reported as supporting the RU and not supporting the RU are based on the total AUs that were assessed (e.g., 487 in the 2010 analysis).

The overall attainment and impairment rates and the changes between reporting years are summarized in Table F-12. Attainment and impairment rates in Table F-12 are based on the total number of watersheds for which sufficient data were available in the respective reporting cycle and not on the total number of assessment units in the state. For the 713 assessment units having sufficient data available to determine the RU assessment status in 2016, 10 percent fully supported the use while 90 percent did not support the use. These results are lower, almost half of the total supporting the recreational use in the 2014 cycle, but comparable to the results from previous cycles that consistently show that only a relatively small proportion of the state's watersheds demonstrate full support of the RU.

Table F-13 contains *E. coli* RU geometric mean criteria attainment rates on an individual site basis for primary contact use Class A and Class B sites by year. While there does not appear to be any discernable trends, recreational use attainment on a site-by-site basis is typically around a quarter to a third of the assessed PCR Class A sites and around 15 percent to 30 percent for PCR Class B sites. Interestingly, the attainment rates are consistently higher for the past eight years for the Class A streams compared to the Class B streams, despite the fact that more stringent criteria apply to the Class A streams compared to the Class B streams. PCR Class C and secondary contact recreation sites were excluded from this table due to very limited sample size relative to the Class A and Class B sites.

Table F-13. Annual *E. coli* geometric mean criteria attainment rates by site.

RU[1]	Applicable Geometric Mean Criterion[2]	Percentage of All Sites Attaining *E. coli* Geometric Mean Criterion by Recreation Season							
		2008	2009	2010	2011	2012	2013	2014	2015
PCR Class A	126 cfu/100 mL	37%	33%	30%	20%	30%	37%	28%	27%
PCR Class B	161 cfu/100 mL	30%	19%	17%	16%	24%	23%	17%	20%

[1] *E. coli* concentrations are expressed in colony forming units (cfu) per 100 milliliters (mL)

RU Attainment Index Score

Since assessment units can often be composed of monitoring sites having a range of *E. coli* geometric means and the range of impairment can be wide between assessment units, a RU index was developed to provide some differentiation between those assessment units composed of monitoring sites that

greatly exceed the criteria versus those where exceedances are comparably low. The index scores also serve as a useful tool in the TMDL prioritization process (see Section J1.1 for more details). Index scores were only assigned to those assessment units for which sufficient *E. coli* monitoring data were available to assess the RU support as described in Section F2. Index scores range from 0-100 depending on the magnitude of exceedance of the site(s) from the applicable criterion within the AU. An index score of 100 indicates that all sites sampled within the AU fully attained the applicable geometric mean *E. coli* criterion, while lower scores indicate a progressively greater average level of exceedance from the criteria for monitored sites within the AU. Figure F-6 summarizes the index scores for the WAUs. The median WAU index score for the 2016 reporting cycle slipped to 63, slightly lower than the median WAU index score of 70 for the 2014 reporting cycle and very similar to the medians of 63 and 65 for the 2012 and 2010 reporting cycles, respectively.

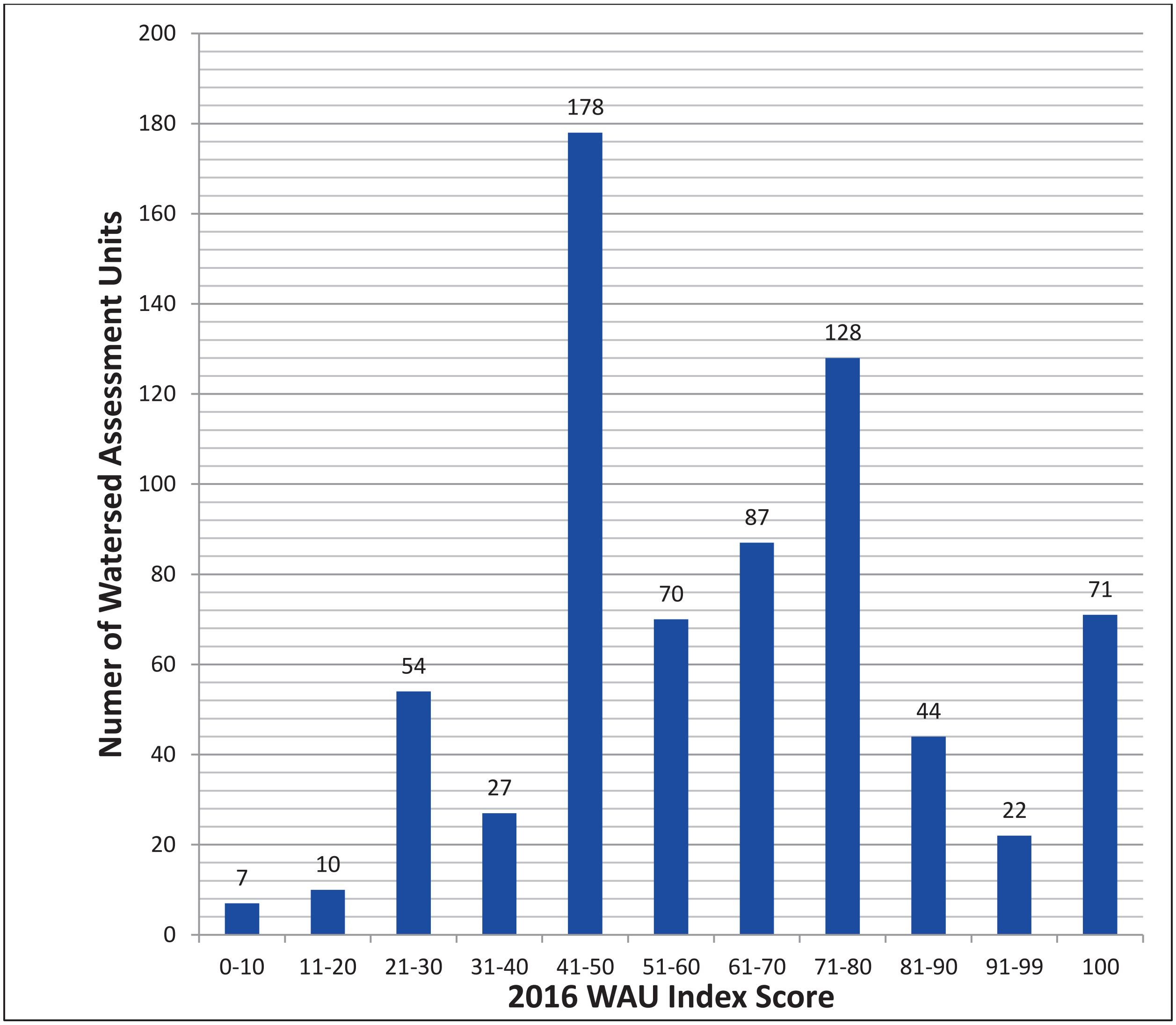


Figure F-6. Histogram of RU index scores for Ohio's WAUs.

The RU attainment status of Ohio's 1,538 WAUs is summarized in Table F-14. This table differs slightly from the summary presented in Table F-12 as this table accounts for those watersheds for which TMDLs have been completed and placed into category 4A and also include historic categorizations carried over from previous reporting cycles.

Table F-14. Summary assessment status of the RU in Ohio's WAUs by Assessment Cycle. See Table J-1 for assessment category descriptions.

Assessment Category	Number of Assessment Units Categorized				Percentage of Assessment Units Categorized			
	2010	2012	2014	2016	2010	2012	2014	2016
1	59	103	141	153	4%	7%	9%	10%
3	888	673	511	252	58%	44%	33%	16%
4	266	341	425	448	17%	22%	28%	29%
5	325	421	461	685	21%	27%	30%	45%
Total	1,538	1,538	1,538	1,538	100%	100%	100%	100%

There are also 23 large rivers in Ohio, eight of which are further divided into two or more subdivisions for a total of 38 large river assessment units. All of Ohio's large river assessment units are designated for Class A primary contact recreation with the exception of a portion of the Maumee River. Large river assessment units have drainage areas greater than 500 square miles and comprise in total 1,236 river miles in the state. The large river assessment units were analyzed independently of the WAUs through which they flow and LRAU data were not included in WAU assessments. Table F-15 summarizes the results of the analysis of *E. coli* data for the large river assessment units and the resulting RU support determinations and index scores. Sufficient data were available to determine the use support status for 17 of the 38 LRAUs (45 percent) in the 2016 reporting cycle, very similar to 16/38 or 42 percent of the LRAUs in the 2014 reporting cycle. These 17 LRAU subdivisions had an average spatial sampling frequency ranging from 2.9 to 7.6 stream miles. Ohio EPA would need to collect samples from 35 to 49 sites per year on large rivers (minimum of 175 to 245 samples) per year in order to be able to maintain up-to-date RU assessments and index scores for all of the LRAUs within the state.

The LRAU with the greatest sampling intensity in terms of sampling location frequency was the Stillwater River, with an average distance of 2.9 river miles between sampling stations. Of the 17 LRAUs having sufficient data to assess, three (Auglaize River, Sandusky River – Wolf Creek to Sandusky Bay, Scioto River – Paint Creek to Sunfish Creek) fully supported the use while the remaining 14 were not supporting the use. Three of the fourteen non-supporting LRAUs are in fact very close to reaching full attainment, having index scores of 90 or greater. The Little Miami River from O'Bannon Creek to the mouth had the lowest index score (40) followed by the Great Miami River from Fourmile Creek to the mouth (46) of all the index scores calculated for the 17 assessed LRAUs.

Table F-15. Summary assessment status of the RU in Ohio's LRAUs.

LRAU	Length (miles)	Number Sampling Stations	Avg Length per station (miles)	Index Score	Assessment Category
Auglaize River	12.86	3	4.3	100	1
Blanchard River	35.65	0	n/a	n/a	3
Cuyahoga River	25.34	6	4.2	67	4A
Grand River	41.28	0	n/a	n/a	4Ah
Great Miami River – Tawawa Creek to Mad River	48.93	6	8.2	n/a	5h
Great Miami River- Mad River to Fourmile Creek	43.10	4	10.8	n/a	5h

LRAU	Length (miles)	Number Sampling Stations	Avg Length per station (miles)	Index Score	Assessment Category
Great Miami River – Fourmile Creek to the mouth	38.38	6	6.4	46	5
Hocking River – Scott Creek to Margaret Creek	32.58	3	10.9	n/a	5h
Hocking River – Margaret Creek to the mouth	36.38	1	36.4	n/a	5h
Licking River	23.21	3	7.7	96	5h
Little Miami River – Caesar Creek to O'Bannon Creek	26.92	0	n/a	n/a	4Ah
Little Miami River – O'Bannon Creek to the mouth	24.00	5	4.8	40	4A
Mad River	18.38	4	4.6	81	5
Mahoning River	37.00	12	3.1	55	5
Maumee River – Indiana state border to Tiffin River	42.11	7	6.0	93	5
Maumee River – Tiffin River to Beaver Creek	34.44	8	4.3	97	5
Maumee River – Beaver Creek to Maumee Bay	31.32	8	3.9	86	5
Mohican River	27.58	1	27.6	n/a	5h
Muskingum River – Walhonding River to Licking River	34.94	0	n/a	n/a	5h
Muskingum River – Licking River to Meigs Creek	46.78	0	n/a	n/a	5h
Muskingum River – Meigs Creek to the mouth	29.42	0	n/a	n/a	5h
Paint Creek	39.17	1	39.2	n/a	5
Raccoon Creek	37.55	0	n/a	n/a	3i
Sandusky River – Tymochtee Creek to Wolf Creek	43.00	2	21.5	n/a	4Ah
Sandusky River – Wolf Creek to Sandusky Bay	22.73	3	7.6	100	1d
Scioto River – Little Scioto River to Olentangy River	32.70	2	16.4	n/a	3i
Scioto River – Olentangy River to Big Darby Creek	31.42	5	6.3	56	5
Scioto River – Big Darby Creek to Paint Creek	37.30	8	4.7	84	5
Scioto River – Paint Creek to Sunfish Creek	36.68	5	7.3	100	1
Scioto River – Sunfish Creek to mouth	26.82	0	n/a	n/a	3
Stillwater River	32.38	11	2.9	82	5
Tiffin River	19.67	4	4.9	69	5
Tuscarawas River – Chippewa Creek to Sandy Creek	30.12	3	10.0	n/a	5h
Tuscarawas River – Sandy Creek to Stillwater Creek	26.05	0	n/a	n/a	3
Tuscarawas River – Stillwater Creek to mouth	47.05	0	n/a	n/a	5h
Walhonding River	23.19	0	n/a	n/a	1h
Whitewater River	8.26	0	n/a	n/a	3
Wills Creek	44.06	9	4.9	78	5

F3.3 Inland Lakes

Data availability for inland lakes is relatively limited compared to that for streams and rivers. A total of 519 samples were collected from 46 different lakes in the period 2011-2015. Lakes were typically sampled at an open water location (L-1), with some larger lakes being sampled at multiple open water locations (L-2, L-3). Samples were collected at beach locations too for those lakes having a swimming beach. Samples were also collected at other locations of interest, such as boat ramps, marinas and water supply intakes. As Ohio's inland lakes sampling program has been rejuvenated, there is more assessment data available compared to that reported in recent IR cycles. Still, the sampling effort at Ohio's inland lakes remains relatively small compared to the monitoring resources for streams and rivers. ODNR maintains a sampling program at state park beaches and is described later in this section. Additional details on the inland lakes sampling program can be found in Section I2 of this report and on Ohio EPA's web page at the following address: http://www.epa.ohio.gov/dsw/inland_lakes/index.aspx.

Table F-16 summarizes the assessment results for the RU of inland lakes at selected sample locations. These data were included as part of the assessment of the WAUs, they are reported below to provide an indication of the performance at individual lakes. Geometric means were generally found to be very low both at open water locations and at beach or other locations sampled. Based on the geometric means, the inland lakes sampled in 2011-2015 are attaining the applicable Class A and Bathing Water *E. coli* criteria at nearly all locations sampled, although it is notable that bacteria levels were observed to occasionally spike above the 235 *E. coli*/100 mL water single sample criterion typically used as the threshold for posting a swimming advisory at a beach.

Table F-16. Summary assessment status of the RU for inland lakes, 2011-2015.

Lake	Sample Location	Sample Year	Number of Samples	Geometric Mean	Maximum Value	Index Score
Alum Creek Lake L-1	Open Water	2013	5	11	20	100
	Open Water	2014	5	24	60	100
Alum Creek Lake L-2	Open Water	2014	4	40	290*	100
Archbold Reservoir #3	Open Water	2013	5	3	6	100
	Open Water	2014	5	4	16	100
Auglaize Power Reservoir	Open Water	2012	6	9	31	100
Barton Lake	Open Water	2013	5	2	3	100
	Open Water	2014	5	5	130	100
Burr Oak Reservoir	Beach	2011	5	47	100	100
Cambridge Reservoir	Open Water	2014	5	13	40	100
	Open Water	2015	4	7	5	100
Caesar Creek Lake	Boat Ramp	2011	5	<1	5	100
		2012	5	<1	1	100
	Beach	2011	5	4	17	100
		2012	5	5	101	100
	Open Water	2011	6	2	20	100
		2012	5	1	1	100
Caldwell Lake	Open Water	2011	5	25	260*	100
	Open Water	2012	4	91	3800*	100
	Beach	2011	5	118	1700*	100
	Beach	2012	4	116	6500*	100
Clendening Reservoir	Open Water	2012	2	<5	5	100
	Open Water	2013	5	10	10	100
Coe Lake	Open Water	2014	4	23	91	100
	Open Water	2015	4	14	72	100
Defiance Power Reservoir	Open Water	2012	6	12	46	100
Delta Reservoir	Open Water	2015	5	2	2	100
Deer Creek Lake	Open Water	2011	6	23	770*	100
	Beach	2012	4	12	20	100
Delphos Reservoir	Open Water	2014	5	2	8	100
	Open Water	2015	4	2	15	100
Evans Lake	Water Intake	2013	4	11	50	100
Findley Lake	Open Water	2012	5	6	12	100
	Open Water	2013	4	4	14	100
	Beach	2012	5	32	170	100
	Beach	2013	4	18	120	100
Forked Run Lake	Open Water	2015	7	16	50	100
Hargus Lake	Open Water	2011	5	14	30	100

Lake	Sample Location	Sample Year	Number of Samples	Geometric Mean	Maximum Value	Index Score
	Marina	2012	4	16	60	100
Hoover Reservoir L-1	Open Water	2013	4	32	500*	100
	Open Water	2014	5	23	200	100
Hoover Reservoir L-3	Open Water	2014	4	34	450*	100
Lake Hamilton	Water Intake	2013	3	8	69	100
Lake Olander	Open Water	2011	5	32	68	100
	Open Water	2012	5	26	56	100
Lake White	Open Water	2011	4	16	60	100
	Open Water	2012	4	<12	20	100
	Beach	2011	5	32	90	100
	Beach	2012	4	13	30	100
Madison Lake	Open Water	2011	6	26	60	100
	Beach	2012	4	13	30	100
McKelvey Lake	Water Intake	2013	4	9	28	100
McKarns Lake	Open Water	2013	5	2	3	100
	Open Water	2014	5	2	2	100
Meander ReservoirL-1	Open Water	2011	5	7	680*	100
	Open Water	2012	3	2	4	100
Meander ReservoirL-2	Open Water	2011	5	6	440*	100
	Open Water	2012	3	3	6	100
Meander Reservoir	Water Intake	2013	5	6	15	100
Metzger Reservoir	Open Water	2011	5	3	41	100
Mosquito Creek Reservoir L-1	Open Water	2013	4	9	30	100
	Open Water	2014	3	4	21	100
Mosquito Creek Reservoir L-2	Open Water	2013	4	4	5	100
	Open Water	2014	5	4	21	100
Mosquito Creek Reservoir L-3	Open Water	2013	4	5	10	100
	Open Water	2014	4	4	10	100
Mosquito Creek Reservoir at Dam	Open Water	2013	3	83	230	100
	Open Water	2014	4	23	190	100
Nettle Lake	Open Water	2013	5	3	8	100
	Open Water	2014	5	5	10	100
New Concord Reservoir	Open Water	2014	5	12	30	100
	Open Water	2015	5	8	10	100
Piedmont Reservoir	Open Water	2012	2	<7	10	100
	Open Water	2013	6	10	10	100
	Essex Bay	2013	5	14	30	100
Pike Lake	Open Water	2011	5	49	250*	100
	Open Water	2012	4	<7	20	100
	Beach	2011	5	92	380*	100
	Beach	2012	4	45	70	100
Ross Lake	Open Water	2011	5	9	20	100
	Open Water	2012	4	<10	20	100
Salt Fork Lake L-1	Open Water	2014	6	22	100	100
	Open Water	2015	5	31	350*	100
Salt Fork Lake L-2	Open Water	2014	6	10	10	100
	Open Water	2015	5	11	20	100
Senecaville Lake	Open Water	2014	6	13	50	100

Lake	Sample Location	Sample Year	Number of Samples	Geometric Mean	Maximum Value	Index Score
	Open Water	2015	4	26	40	100
Stonelick Reservoir	Open Water	2012	9	16	70	100
	Open Water	2013	5	28	5820*	100
Stewart Lake	Open Water	2011	5	25	110	100
Summit Lake	Open Water	2012	5	32	870*	100
	Open Water	2013	7	33	96	100
Tappan Lake	Open Water	2012	2	10	10	100
	Open Water	2013	5	11	20	100
	Beach	2012	3	506**	8400*	50
	Beach	2013	4	24	80	100
Van Wert Reservoir #2	Open Water	2014	5	2	5	100
	Open Water	2015	4	7	140	100
Veto Lake	Open Water	2015	3	15	70	100
Veto Lake-Plum Run Arm	Open Water	2015	8	59	2500*	100
Wallace Lake	Open Water	2014	4	33	110	100
	Open Water	2015	2	30	37	100
Waynoka Lake	Open Water	2015	5	6	28	100
	Beach	2015	3	18	44	100
Wellington Reservoir	Boat Ramp	2012	3	201**	740*	75
	Boat Ramp	2013	4	14	49	100
Wellington Reservoir	Open Water	2012	4	3	10	100
	Open Water	2013	5	2	6	100
Wills Creek Reservoir	Open Water	2014	5	25	100	100
	Open Water	2015	3	37	130	100
Winton Lake	Campground	2013	5	40	326*	100
	Campground	2014	5	43	1120*	100

*Value exceeds the single sample maximum bathing water criterion of 235 cfu/100mL.
**Value exceeds the geometric mean bathing water criterion of 126 cfu/100mL.

ODNR's Division of Parks and Recreation also conducts routine bacteria sampling of public bathing beaches at inland state park beaches pursuant to Ohio Revised Code sections 1541.032 and 3701.18. Advisory signs are posted whenever notified by the director of the Ohio Department of Health that the bacteria levels in the waters tested present a possible health risk to swimmers. Advisory postings are recommended whenever the *E. coli* density of a water sample exceeds the bathing water single sample maximum of 235 cfu/100 mL. Sampling frequency at the inland state park beaches is generally once every two weeks. This sampling frequency is much less intense compared to sampling frequency at many of the Lake Erie beaches, which is typically four or more days per week.

Table F-17 summarizes the advisory postings from 2011 through 2015 at 68 of the state's inland state park beaches. Beaches at which more than 10 percent of the samples collected over a recreation season exceeded 235 cfu/100 mL (the bathing beach criterion) are highlighted. The inland lake data from ODNR are presented in the IR for informational purposes and not for official use support determinations since the level of data credibility was indeterminate at the publication of this report. Its inclusion here is intended to notify readers of the existence of this sampling program for these popular recreational resources in Ohio and to provide some information as to the relative amount of data and relative water quality conditions with respect to bacteria indicators. Should Ohio EPA affirm the data as level 3 credible data in the future, it will be considered in the process for making official use support determinations.

Table F-17. Swimming advisory postings at Ohio's inland lake public beaches (2011-2015).

Park	Beach	County	2011[a]	2012[a]	2013[a]	2014[a]	2015[a]	Total [a]
Alum Creek	Main	Delaware	8/57	4/60	2/10	3/10	2/9	19/146
	Camp	Delaware	1/36	--	0/9	2/10	1/8	4/63
Barkcamp		Belmont	0/4	0/8	1/8	0/8	0/12	1/40
Blue Rock		Muskingum	0/9	0/8	0/8	2/10	2/10	4/45
Buck Creek	Main	Clark	2/32	9/46	8/51	0/8	1/9	20/146
	Camp	Clark	0/15	0/12	0/5	0/9	0/8	0/49
Buckeye Lake	Crystal Beach	Fairfield	12/49	7/15	3/8	10/15	3/4	35/91
	Fairfield Beach	Fairfield	4/51	8/13	0/8	8/14	3/4	23/90
	Brooks Park	Fairfield	13/49	7/14	8/12	8/14	3/3	39/92
Burr Oak	Main	Athens	0/7	0/9	0/9	0/7	1/10	1/42
	Lodge	Athens	0/7	0/8	--	--	0/4	0/19
Caesar Creek	North	Warren	1/5	0/7	0/7	0/8	3/11	4/38
	South	Warren	1/5	1/8	6/10	3/9	1/11	12/43
Cowan Lake	Main (S)	Clinton	2/8	0/8	0/7	0/8	2/11	4/42
	Camp (N)	Clinton	1/7	0/8	0/7	1/9	1/10	3/41
Deer Creek		Pickaway	0/5	0/7	0/8	0/8	0/10	0/38
Delaware		Delaware	1/8	0/6	0/6	2/7	3/9	6/36
Dillon	Boaters	Muskingum	0/0	0/0	--	--	--	0/0
	Swimmers	Muskingum	2/9	2/10	4/10	5/12	6/11	19/52
East Fork	Main	Clermont	0/8	0/15	0/14	0/7	0/16	0/60
	Camp	Clermont	0/7	0/15	0/14	0/10	0/16	0/62
Findlay		Lorain	0/2	0/7	0/6	0/8	0/9	0/32
Forked Run		Meigs	0/4	0/8	0/8	0/7	2/12	2/39
Grand Lake St. Marys	Main East	Auglaize	6/49	2/37	1/7	2/10	2/9	13/112
	Main West	Auglaize	8/46	2/9	4/8	4/11	3/11	21/85
	Camp	Auglaize	8/49	2/36	1/7	3/10	1/9	15/111
	Windy Point	Auglaize	--	--	2/8	1/9	4/10	7/27
Guilford Lake	Main	Columbiana	0/6	1/7	1/7	1/8	0/7	3/35
	Camp	Columbiana	0/3	2/8	0/7	1/8	0/7	3/33
Harrison Lake		Fulton	0/0	0/0	0/3	1/9	1/10	2/22
Hueston Woods		Preble	0/5	0/3	1/12	2/13	1/9	4/42
Indian Lake	Fox Island	Logan	0/3	0/1	0/7	0/3	0/9	0/23
	Camp	Logan	0/3	0/1	0/7	0/3	1/9	1/23
	Oldfield	Logan	0/3	0/1	1/8	0/3	1/9	2/24
Jackson Lake		Jackson	1/8	0/8	1/6	1/9	2/10	5/41
Jefferson Lake		Jefferson	1/2	1/7	0/6	1/9	1/8	4/32
Kiser Lake		Champaign	0/1	1/7	0/7	2/8	2/9	5/32
Lake Alma	#1-West	Vinton	0/8	1/9	0/7	1/9	0/6	2/39
	#2-East	Vinton	1/8	0/8	--	--	0/4	1/20
Lake Hope		Vinton	0/8	0/8	2/8	0/7	0/8	2/39
Lake Logan		Hocking	2/11	0/8	0/8	1/11	0/8	3/46
Lake Loramie		Shelby	0/7	0/8	2/10	1/7	5/12	8/44
Lake Milton		Mahoning	1/7	0/7	0/5	2/11	0/8	3/38
Lake White		Pike	1/8	0/8	0/7	0/7	--	1/30
Madison Lake		Madison	1/7	5/9	1/7	1/9	6/12	14/44
Mosquito		Trumbull	1/6	0/8	3/8	0/7	3/9	7/38
Paint Creek		Ross	0/7	0/8	0/7	1/8	0/8	1/40
Pike Lake		Pike	0/8	0/8	1/8	--	2/7	3/31

Park	Beach	County	2011[a]	2012[a]	2013[a]	2014[a]	2015[a]	Total[a]
Portage Lakes	Main	Summit	0/4	1/9	0/8	0/8	1/9	2/38
	Camp	Summit	0/4	0/7	0/8	0/8	1/ 4	1/31
Punderson		Geauga	0/0	0/3	0/1	0/5	0/7	0/16
Pymatuning	Main	Ashtabula	1/7	0/8	2/9	--	0/7	3/31
	Camp	Ashtabula	1/7	0/8	0/8	--	1/7	2/30
	Cabins	Ashtabula	0/5	0/8	0/8	--	0/6	0/27
Rocky Fork	North Shore	Highland	1/9	0/8	0/7	0/8	1/8	2/40
	South Shore	Highland	1/9	0/9	0/7	1/9	1/8	3/42
Salt Fork	Main	Guernsey	1/8	0/8	0/8	1/9	0/8	2/41
	Camp	Guernsey	0/8	0/8	0/8	0/8	0/8	0/40
	Cabins	Guernsey	0/8	0/7	0/8	0/8	0/8	0/39
Scioto Trail		Ross	5/12	6/13	0/6	6/11	1/8	18/50
Shawnee	Turkey Cr Lodge	Scioto	1/6	2/6	0/6	2/9	1/9	6/36
	Roosevelt-Camp	Scioto	2/8	1/5	1/6	--	0/6	4/25
Stonelick		Clermont	0/8	0/15	0/14	0/8	0/16	0/61
Strouds Run		Athens	1/6	0/8	0/8	0/7	2/10	3/39
Tar Hollow	Main	Ross	1/9	0/8	0/6	1/9	2/9	4/41
	Camp	Ross	1/8	0/8	2/9	0/9	1/8	4/42
West Branch	Main	Portage	1/10	0/10	1/5	2/12	0/8	4/45
	Camp	Portage	--	--	--	2/11	0/8	2/19
Wolf Run		Noble	0/0	0/0	0/8	0/7	0/8	0/23
	Total Advisory Postings[a]		**96**	**65**	**59**	**85**	**81**	**386/ 3,113**

[a] Indicates the number of advisories posted, based on a measured *E. coli* density exceeding 235 cfu/100 mL, followed by the number of samples collected.

Beaches at inland state park lakes are tested for bacteria less frequently compared to those beaches along Lake Erie. Sampling was most frequent at Alum Creek Lake (2011-2012), Buck Creek Lake-main (2011-2013), Buckeye Lake (2011) and Grand Lake St. Marys (2011). Even at these beaches, the sampling frequency is roughly only half as intense as that of many Lake Erie beaches (Table F-7). The more intensive sampling that had been occurring at these beaches earlier in this reporting cycle tapered off during the later years of this reporting cycle.

The sample results in Table F-17 indicate that at most inland lake beaches, the bacteria criteria are not frequently exceeded, resulting in fewer postings compared to some of the beaches along Lake Erie. There were 45 inland lake beaches where the overall exceedance frequency was less than 10 percent for the five-year reporting period. Overall, the frequency of exceedances for all the inland lake beaches during the five-year reporting period was 12.4 percent, slightly higher than the 10.5 percent reported in the 2008-2012 reporting period. There were 23 inland lake beaches where the aggregated exceedance frequency was over 10 percent. The highest aggregated exceedance frequency of 42 percent was found at the Brooks Park beach at Buckeye Lake. Nine beaches exceeded the bathing water criteria over 25 percent of the time over the five-year reporting period total: Buckeye Lake Brooks Park, Fairfield and Crystal beaches; Grand Lake St. Mary's main beach (west) and Windy Point beaches; Dillon Lake swimmers beach, Caesar Creek (south beach), Madison Lake and Scioto Trail Lake. Sample results at some inland lake beaches indicated a need for posting an advisory much more frequently during certain years. For example, 67 percent of the samples collected during the 2014 recreation season at the Buckeye Lake's Crystal Beach exceeded the applicable single sample bathing water criterion. More frequent sampling, particularly at beaches where previous sampling data indicates an increased

likelihood of exceeding the recreation criteria, should be considered by beach managers so that the public can be adequately informed of actual water quality conditions at the time of their visit.

Evaluating Beneficial Use: Aquatic Life

G1. Background and Rationale

G1.1 Background

Ohio EPA has been evaluating streams using standardized biological field collection methods for nearly 40 years. Stream assessments are based on the experience gained through the collection of well over 26,000 fish population samples, nearly 13,500 macroinvertebrate community samples and close to 210,000 water chemistry samples. Aquatic life use (ALU) assessments for the 2016 Integrated Report (IR) are based on biological and chemical data collected from primarily 2005-2014 at over 4,250 wadeable stream, large river and Lake Erie shoreline sampling locations; some 2003 and 2004 data were included in the large river assessments. Ohio's Credible Data Law states that all data greater than five years in age will be considered historical, but that it can be used as long as the director of Ohio EPA has identified compelling reasons as to why the data are credible. In the case of biological monitoring data, the use of data older than five years ("historical") is necessary because not enough biological samples are gathered from enough locations each year to conduct a thorough assessment of ALU status across the state. Owing to limited staff and budget resources, it generally takes ten to fifteen years to visit a sufficient number of assessment units (AUs) and sufficiently monitor them to make ALU assessments. A more complete picture of statewide ALU health is presented when data are utilized based on the 10- to 15-year timeframe. Since water resource quality in many watersheds in Ohio today is most susceptible to changing land use patterns that are often subtle, slow to evolve and difficult to monitor and assess, the use of older data is justified.

Ohio's water quality standards (WQS) have seven subcategories of ALUs for streams and rivers (see Ohio Administrative Code 3745-1-07, http://www.epa.ohio.gov/portals/35/rules/01-07.pdf). The WQS rule contains a narrative for each ALU and the three most commonly assigned ALUs have quantitative, numeric biological criteria that express the minimum acceptable level of biological performance based on three separate biological indices. These indices are the Index of Biotic Integrity (IBI) and Modified Index of Well-Being (MIwb) for fish and the Invertebrate Community Index (ICI) for aquatic macroinvertebrates. A detailed description of Ohio EPA's biological assessment and biocriteria program including specifics on each index and how each was derived is available (see Biological Criteria for the Protection of Aquatic Life, http://www.epa.ohio.gov/dsw/bioassess/BioCriteriaProtAqLife.aspx).

Procedures established in a specially designed 1983-1984 U.S. EPA study known as the Stream Regionalization Project (Whittier et al. 1987) were used to select reference, or least impacted sites, in each of Ohio's five Level III ecoregions (Omernik 1987). Biological data from a subset of these sites in addition to supplemental data from other least impacted Ohio reference sites were used to establish the ecoregion-specific biocriteria for each ALU. Note that some criteria vary according to stream size and some indices do not apply in certain circumstances. Ohio's WQS rule stipulates that "biological criteria provide a direct measure of attainment of the warmwater habitat, exceptional warmwater habitat and modified warmwater habitat ALUs" [OAC 3745-1-07(A)(6)]. The numeric biological criteria based on IBI, MIwb and ICI thresholds applicable to exceptional warmwater habitat (EWH), warmwater habitat (WWH) and modified warmwater habitat (MWH) waters are found in Table 7-15 of the WQS rule. Neither coldwater habitat (CWH) nor limited resource water (LRW) streams have numeric biological criteria at this time, so attainment status must be determined on a case-by-case basis. For sites and segments designated with these ALUs, attainment status was determined by using biological data attributes (e.g., presence and abundance of coldwater species in CWH streams) and/or interim assessment index targets (*e.g.*, those for LRW streams, Lake Erie lacustuaries, Lake Erie shoreline) to assess consistency with the narrative ALU definitions in the WQS.

G1.2 General Determination of Attainment Status

A biological community at an EWH, WWH or MWH sampling site must achieve the relevant criteria for all three indices or those available and/or applicable, in order to be in full attainment of the designated ALU criteria. Partial attainment is determined if one criterion is not achieved while non-attainment results when all biological scores are less than the criteria or if poor or very poor index scores are measured in either fish or macroinvertebrate communities.

A carefully conceived ambient monitoring approach, using cost-effective indicators consisting of ecological, chemical and toxicological measures, can ensure that all relevant pollution sources are judged objectively on the basis of environmental results. Ohio EPA relies on a tiered approach in attempting to link the results of administrative activities with true environmental measures. This integrated approach includes a hierarchical continuum from administrative to true environmental indicators. The six "levels" of indicators include: 1) actions taken by regulatory agencies (permitting, enforcement, grants); 2) responses by the regulated community (treatment works, pollution prevention); 3) changes in discharged quantities (pollutant loadings); 4) changes in ambient conditions (water quality, habitat); 5) changes in uptake and/or assimilation (tissue contamination, biomarkers, wasteload allocation); and, 6) changes in health, ecology or other effects (ecological condition, pathogens). In this process, the results of administrative activities (levels 1 and 2) can be linked to efforts to improve water quality (levels 3, 4 and 5), which should translate into the environmental "results" (level 6). Thus, the aggregate effect of billions of dollars spent on water pollution control since the early 1970s can now be determined with quantifiable measures of environmental condition.

Superimposed on this hierarchy is the concept of stressor, exposure and response indicators. Stressor indicators generally include activities that have the potential to degrade the aquatic environment, such as pollutant discharges (permitted and unpermitted), land use effects and habitat modifications. Exposure indicators are those that measure the effects of stressors and can include whole effluent toxicity tests, tissue residues and biomarkers, each of which provides evidence of biological exposure to a stressor or bioaccumulative agent. Response indicators are generally composite measures of the cumulative effects of stress and exposure and include the more direct measures of community and population response that are represented here by the biological indices that comprise Ohio's biological criteria. Other response indicators could include target assemblages, i.e., rare, threatened, endangered, special status and declining species or bacterial levels that serve as surrogates for the recreation uses. These indicators represent the essential technical elements for watershed-based management approaches. The key, however, is to use the different indicators within the roles that are most appropriate for each indicator.

Identifying the most probable causes of observed impairments revealed by the biological criteria and linking this with pollution sources involves an interpretation of multiple lines of evidence including water chemistry data, sediment data, habitat data, effluent data, biomonitoring results, land use data and biological response signatures within the biological data themselves. Thus, the assignment of principal causes and sources of impairment represents the association of impairments (defined by response indicators) with stressor and exposure indicators. The identified causes of impairment will serve as the target parameters for future total maximum daily load (TMDL) development or regulatory program actions.

Adequate sampling is necessary to represent the ALU attainment status for large river assessment units (LRAUs, each an average 32 miles in length) or watershed assessment units (WAUs, each an average 28

mi^2 in surface area); these AUs are defined in Sections D1 and G2 and further detailed in Section J of this report. Despite Ohio EPA's significant commitment to biological sampling efforts, about 36 percent of Ohio's 1538 WAUs are precluded from this analysis because of no or insufficient data or data are considered historical (at least 10 years old). However, most large Ohio rivers with LRAU reaches have current data; however, three major rivers (four LRAUs) are being assessed with data collected just outside the 10-year window. While some data may be available for some of the AUs, many have no water quality monitoring data or the scope of monitoring was judged to be too limited to adequately generate an assessment. Generally, at least two sample sites are minimally considered necessary for a WAU assessment, although under specific circumstances, a WAU may be evaluated with one site. Presently, Ohio EPA prefers that the principal investigators make informed decisions about the data relevance for a particular AU evaluation rather than institute specific guidance on minimum effort.

Recognizing the state's limited resources, one way to increase assessment unit coverage is to utilize all available relevant data. While Ohio EPA uses data from a variety of sources in its work, the data used to determine the ALU status in this report were primarily collected by Ohio EPA. For this report and some past reports, additional biological data were provided by the Ohio Department of Natural Resources (ODNR), Northeast Ohio Regional Sewer District (NEORSD), U.S. Geological Survey (USGS), the University of Toledo, the Ohio State University, National Center for Water Quality Research (NCWQR) at Heidelberg College, Midwest Biodiversity Institute (MBI), Cleveland Metroparks and EnviroScience, Inc. Those interested in providing data to Ohio EPA for ALU attainment status determinations must attend appropriate training provided by Ohio EPA or its designee (e.g., through the Ohio Credible Data Program Level 3 Certification) and document and retain competency in Ohio EPA biological sampling protocols. All data used to make attainment determinations are carefully reviewed for consistency with all Ohio EPA methods and guidance.

G2. Evaluation Method

G2.1 Rivers and Streams: LRAUs

Decades of monitoring work by Ohio EPA have resulted in an extensive data set that includes data for all 38 LRAUs in Ohio with sampling spanning 2003-2014. The longitudinal sampling pattern (upstream to downstream and bracketing pollution sources and tributaries) used to measure fish community health, macroinvertebrate community condition and water chemistry allows WQS biocriteria attainment status to be fairly precisely estimated based on linear distances. The length of the large river deemed to be in full attainment, as described in the previous section, is divided by the total assessed length of the large river and multiplied by 100 to yield a value between 0 (no miles in attainment) and 100 (all miles in attainment). An LRAU is considered meeting its designated ALU only if a score of 100 is reported. In other words, if all miles are not in full attainment of the designated ALU, the entire LRAU is listed as impaired and placed in IR Category 4 or 5, depending on whether a TMDL is required.

G2.2 Rivers and Streams: WAUs

Beginning with the 2010 IR, the ALU assessment methodology defined the WAU as the USGS 12-digit hydrologic unit code watershed or HUC12 (1,538 HUCs averaging 28 mi^2 drainage areas), rather than the 11-digit HUC watershed (331 HUC11s averaging 130 mi^2 drainage areas) used in prior IRs. Reporting on the HUC12 scale provides information on a finer scale and allows for better reporting of watershed improvements.

This dramatic reduction in assessment unit size requires consideration of what constitutes adequate sampling within each HUC12 WAU and appropriate evaluation of the sampling results. The relatively small drainage area of the HUC12 WAU requires that the sites evaluated adequately characterize the smaller watershed. For that reason, three scores will be determined for each WAU when sufficient data make this possible. A headwater assessment score that characterizes the aquatic community of the WAU by itself will occur by evaluating all sites with drainage area <20 mi^2 together. A wading stream score will be determined for all sites with drainage area between 20 mi^2 and 50 mi^2 that occur within the WAU. The wading stream score is necessary since a site between 20 mi^2 and 50 mi^2 characterizes the entire watershed upstream from the site, potentially two or more HUC12s, not just to the extent of the WAU boundary where the site resides. A principal stream score for sites >50 mi^2 will also be calculated, as these larger streams reflect a much greater land area than sites at a smaller drainage area. The final assessment unit score will be derived from these three scores. The table below represents this graphically.

WAU (HUC12)	Headwater Assessment-HA (<20 mi^2)			Wading Assessment-WA (≥ 20 mi^2 <50 mi^2)			Intermediate Score (IS)	Principal Assessment- PA (≥ 50 mi^2 <500 mi^2)			WAU Score
	Total Sites	# Sites Full	HA Score	Total Sites	# Sites Full	WA Score	$\frac{HA+WA}{2}$	Total Sites	# Sites Full	PA Score	$\frac{IS+PA}{2}$

While the smaller size of the HUC12 WAU greatly reduces the number of sites necessary to be assessed, this creates an emphasis on appropriate sampling locations within the assessment unit. To ensure that decisions regarding adequate coverage are uniformly carried out, a flow chart for the process was created (Figure G-1). The flow chart takes into account the drainage area associated with a minimal number of sites and incorporates questions as to spatial proximity of the sites within the watershed, land use consistency among sampling locations and location of significant dischargers within the WAU.

Once it is determined that sampling coverage is adequate to conduct a WAU assessment, the number of headwater sites demonstrating full ALU attainment are divided by the total number of headwater sites within the WAU. The quotient is then multiplied by 100 to provide the headwater score.

Determining the wading stream and principal stream scores involve a similar approach. The wading stream score is based on the number of wading stream sites (sites draining a watershed between 20 mi^2 and 50 mi^2) demonstrating full attainment of ALU. The total number of wading stream sites in full attainment are divided by the total number of wading stream sites. The quotient is then multiplied by 100 to provide the wading stream score. The same methodology is used to produce the principal stream score, but the scoring is limited to those sites in the WAU draining >50 mi^2.

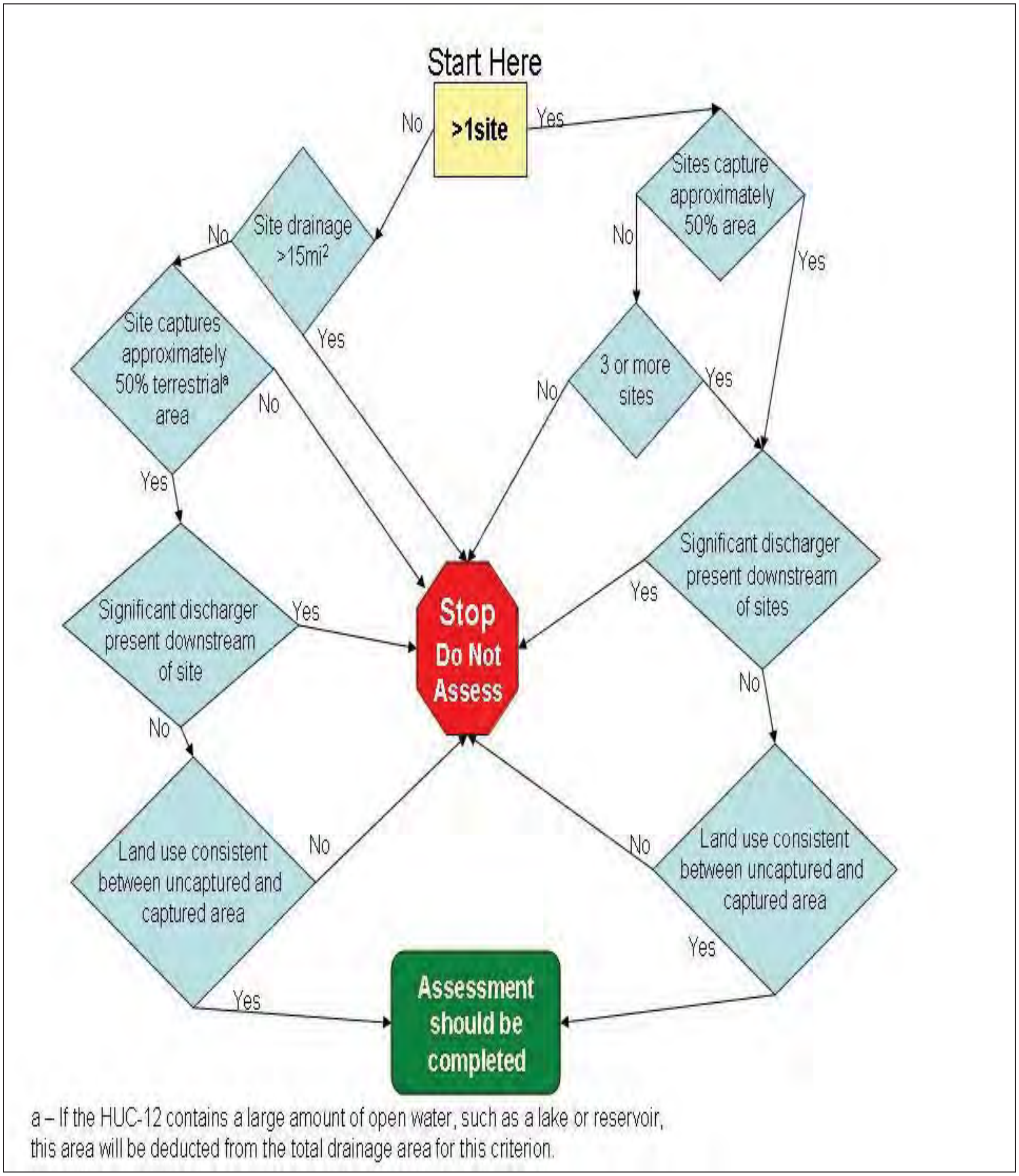


Figure G-1. Flowchart for determining if WAU score can be derived based on available sampling locations.

An intermediate WAU score is calculated as the average of the headwater and wading stream scores. The overall WAU score is derived by averaging the intermediate score and the principal stream score. For HUC12s without principal streams, the intermediate stream score will represent the overall WAU score. This procedure provides some weighting to the assessment when principal stream miles are present (i.e., more influence on the final watershed score by principal streams). This weighting is important in that full use or impairment within the principal streams reflects the overall condition of the much larger primary watershed. A manual scoring adjustment is made in those few instances when a WAU score, with many principal stream sites, is unduly affected by the results from one headwater or one wading site. A WAU meets its aquatic life designated use only if a score of 100 is reported. In other words, if all sites are not in full attainment of the designated ALU, the WAU is listed as impaired and placed in IR Category 4 or 5, depending on whether a TMDL is required.

Additional synthesis of data was used to provide aggregate statewide statistics for Ohio's universe of assessed wading and principal streams and rivers (> 20 mi^2 drainage areas) and large rivers (> 500 mi^2 drainage areas). Baseline IR statistics generated beginning with the 2010 IR were used along with the updated 2016 IR results to track trends of attainment levels across Ohio's watersheds and large rivers in an effort to quantify progress made in point and nonpoint source pollution controls and in meeting Ohio's goals of 80 percent full ALU attainment by 2020 for assessed WAU wading and principal stream and river sites and 100 percent full ALU attainment by 2020 for assessed LRAU miles.

G2.3 Lake Erie Shoreline and Islands: Lake Erie Assessment Units (LEAUs)

ALU determinations are predicated on a narrative description of the aquatic community associated with the relevant use tier. In the absence of numeric criteria, the narrative expectation provides the impairment determination. In 1997, Ohio EPA completed the document *Development of Biological Indices Using Macroinvertebrates in Ohio Nearshore Waters, Harbors, and Lacustuaries of Lake Erie in Order to Evaluate Water Quality* (Lake Erie Protection Fund Grant LEPF-06-94, undated draft). In 1999, the document *Biological Criteria for the Protection of Aquatic Life: Volume IV: Fish and Macroinvertebrate Indices for Ohio's Lake Erie Nearshore Waters, Harbors, and Lacustuaries* was produced (Ohio EPA, undated draft). Also in 1999, the document *Biological Monitoring and an Index of Biotic Integrity for Lake Erie's Nearshore Waters* (Thoma, 1999) was published as a book chapter in *Assessing the Sustainability and Biological Integrity of Water Resources Using Fish Communities* (Simon, editor, 1999). The data analyses in these documents, including refinement of field sampling protocols and development of assessment indices, provide a foundation to establish numeric biological targets/expectations using IBI and MIwb scores for ALU in Lake Erie along the Ohio shoreline and in lacustuary areas. The term "lacustuary" was coined to specify the zone where Lake Erie water levels have intruded into tributary river channels. The ALU status of a lacustuary is included as part of the assessment of the tributary WAU or LRAU.

Excluding lacustuaries, the status of the Lake Erie shoreline and islands is currently evaluated using fish community assessment targets for the Lake Erie IBI and MIwb based on night electrofishing at sites included in the three LEAUs: Lake Erie Western Basin Shoreline (including Maumee Bay and Sandusky Bay), Lake Erie Central Basin Shoreline and Lake Erie Islands Shoreline. All available fish data were collected from areas within 100 meters of the mainland, bay or island shoreline. Status of LEAUs was determined by the percentage of sites in narrative full attainment of biological targets (scaled to prevailing shoreline habitat type) and where sufficient and current biosurvey data were available.

Ohio EPA was awarded a Great Lakes Restoration Initiative (GLRI) grant in 2010 to develop a comprehensive Lake Erie nearshore monitoring program. This 2011-2013 project included a strategy to design and implement a monitoring program for the Ohio Lake Erie nearshore zone (including bays, harbors and lacustuaries) that can be maintained on an annual basis. It is anticipated that future IRs will include revised AUs and an updated assessment methodology for the LEAUs based on the results of the GLRI study (For a preview of anticipated revisions, see Section I5 of the 2014 IR).

The GLRI grant was a collaborative effort between state agencies (Ohio EPA and ODNR) and major universities with Lake Erie basin research interests and expertise (the Ohio State University, University of Toledo, John Carroll University and Heidelberg University). Physical, chemical and biological parameters monitored from 2011-2013 provided data to support long-term trend analysis, establish background conditions in selected areas and conduct sampling related to the impacts of projects implemented in tributaries of the Lake Erie watershed. Data will be used to monitor the progress of implementation projects in Areas of Concern (AOCs) to restore beneficial uses, track implementation of WAPs, develop TMDLs for pollutants impairing beneficial uses, support Balanced Growth Initiative actions on the shoreline and provide updated information for IRs, Lake Erie quality index updates and updates to the Lake Erie Lakewide Management Plan (LAMP). More information about the GLRI and projects which have been proposed can be found at the Ohio Lake Erie Commission web site (see GLRI, http://www.lakeerie.ohio.gov/GLRI.aspx).

For field years 2016 and 2017, Ohio EPA is utilizing a federal fiscal year[1] 2014 Clean Water Act (CWA) Section 106 Supplemental Monitoring grant to continue funding the base monitoring program conducted by Ohio EPA at shoreline, nearshore and open water sites in Lake Erie. Details of the monitoring program are provided in the current year study plan available at the following web site: http://epa.ohio.gov/dsw/lakeerie/index.aspx#125073721-nearshore-monitoring.

Of note, future Lake Erie assessments will be the collection of shoreline data for the National Aquatic Resource Survey (NARS) of coastal waters of the United States (the National Coastal Condition Assessment - NCCA), which was conducted during the summer of 2015. Coordinated by U.S. EPA in collaboration with Great Lake states, these one-visit snapshots of lake water quality will be used to provide statistically valid national and regional assessments of Great Lakes resource condition. Additional information and 2010 NCCA results, when available, can be found at the U.S. EPA NARS website (see National Aquatic Resource Surveys, http://www.epa.gov/OWOW/monitoring/nationalsurveys.html).

G3. Results

For the 2016 IR, new aquatic life data collected in 2013 and 2014 were incorporated into the assessment database. During this period, biosurvey data from nearly 850 sampling sites located in 226 HUC12 WAUs, 56 sampling sites located in five LRAUs and 21 samples collected from the three LEAUs were available to completely or partially update previously assessed AUs or provide new assessments for AUs with unknown aquatic life status. All data were collected by the Ohio EPA or Level 3 Qualified Data Collector external sources. Watersheds intensively monitored during 2013 and 2014 included the lower Mahoning River, Bokes Creek, lower Muskingum River tributaries, Stillwater River, St. Joseph River, Tiffin River, lower Auglaize River tributaries, Rocky River, Wills Creek, Southwest Ohio River tributaries and Big Darby Creek basins. Large rivers intensively sampled included the Mahoning River, Cuyahoga River,

[1] The federal fiscal year (FFY) is from October 1 to September 30.

Wills Creek, Stillwater River and Tiffin River. Detailed watershed survey reports for many of the basins mentioned above are or will be available from the Ohio EPA Division of Surface Water (see Biological and Water Quality Report Index, http://www.epa.ohio.gov/dsw/document_index/psdindx.aspx).

A further examination of individual AUs was made to determine status changes caused by site data collected during 2003 and 2004 that now exceed the 10-year data threshold and have become "historical" since the 2014 IR. From this examination, it was determined that data from 119 HUC12 WAUs were now insufficient to provide adequate spatial coverage either due to (1) all data being age restricted or (2) enough of the data are age restricted that the number of sites fell below the minimum needed to assess. These AUs are not being delisted if currently Category 5. Significant basins affected, along with last sampling year, include the Olentangy River (2003), Toussaint Creek (2003), Wakatomika Creek (2003), Mad River (2003), lower Grand River (2004) and Hocking River (2004), as well as numerous WAUs in the Tuscarawas River basin assessed in 2003 and 2004. Four LRAUs (Grand River, Hocking River [2] and Mad River) were last sampled in 2003 and/or 2004. However, as these three large rivers were not expected to have changed significantly since the previous sampling, the data is being retained and used in the overall assessment of the large river data.

Summarized 2016 IR statistics for aquatic life assessments for large river, watershed and Lake Erie AUs as well as the comparable statistics from the 2002-2014 IRs are tabulated in Table G-1. More detailed ALU results and statistics for each 2016 AU (watershed, large river and Lake Erie units) with current data are provided at Ohio EPA web pages which can be accessed at http://epa.ohio.gov/dsw/tmdl/OhioIntegratedReport.aspx.

G3.1 LRAUs

LRAUs in Ohio (38 LRAUs spanning 23 rivers with watersheds in excess of 500 square miles and totaling 1,248 river miles) reflected a small decline in percent of monitored miles in full attainment compared to the same statistic reported in the 2014 IR (Table G-1, Figure G-2). Based on monitoring through 2014, the full attainment statistic now stands at 87.4 percent (1063 of 1216 assessed LRAU miles), down 1.8 percent from the 2014 IR. It should also be noted that there was at least one site in 20 of the 38 LRAUs that was not fully supporting the ALU, so those 20 LRAUs are considered impaired (Table G-4).

Significant large rivers assessed during 2013 and 2014 included the Mahoning River (2013), Tiffin River (2013), Stillwater River (2013), Wills Creek (2014) and Cuyahoga River (2014). Attainment statistics for these five rivers (5 LRAUs) are as follows:

- Mahoning River: 45 percent full attainment over 35 miles
- Tiffin River: 100 percent full attainment over 20 miles
- Stillwater River: 95 percent full attainment over 32 miles
- Wills Creek: 55 percent full attainment over 44 miles
- Cuyahoga River: 69 percent full attainment over 24 miles

While both the Stillwater River and Cuyahoga River have had fairly recent assessments prior to 2013 and 2014, respectively and neither reflected significant change, assessments of the other three rivers documented important positive change since their first comprehensive monitoring in the early 1990s, as follows:

- Mahoning River (1994): 0 percent full attainment over 35 miles
- Tiffin River (1992): 0 percent full attainment over 20 miles
- Wills Creek (1994): 16 percent full attainment over 44 miles

In spite of these three rivers showing substantial improvement in ALU attainment based on the most recent monitoring and assessment, the overall 1.8 percent decline in total LRAU miles in full attainment between the 2014 IR and 2016 IR was due to fact that, collectively, the percentage of miles in full attainment for the Mahoning and Wills AUs stands at only 50 percent. These LRAUs were reported with historical data status in past IRs and, thus, were not included in attainment statistics.

Progress towards the “100 percent by 2020” ALU goal for Ohio’s large rivers is depicted in Figure G-2. Between the 2002 and 2016 reporting cycles, the percentage of large river miles in full attainment has increased from 62.5 percent to 87.4 percent and, for the first time, nearly 100 percent of total miles have been assessed. Continued success in approaching the 100 percent full attainment threshold for 100 percent of large river miles by 2020 will be dependent on sustained resources allocated to monitoring LRAUs with an emphasis on those which are likely to become historical between now and 2018 (the last year of data to be included in the 2020 goal assessment) and which are currently not scheduled to be resampled before then (8 large rivers/10 AUs representing nearly 310 large river miles).

G3.2 WAUs

For the 2016 IR, the average HUC12 watershed assessment unit (WAU) score reflected a positive increase from the corresponding score reported in the 2014 IR (Table G-1, Figure G-3). Based on monitoring through 2014, the average HUC12 WAU score stands at 61.5, a 2.3 point increase from the 2014 IR and typical of what has been observed over the last several cycles (a pattern of steady increases of 1-2 points). Included in Table G-1 and depicted in Figure G-3 is the corresponding average score based on the old HUC11 WAUs, which were tracked from 2002 through 2010 and were used to gauge the progress of the “80 by 2010” ALU goal as reported in the 2010 IR.

Table G-2 depicts the breakdown of site full attainment based on the watershed size category used to determine an individual watershed’s score based on available sites in the HUC12 WAU. As in previous reports, the results show that biological impairment is more likely at sites on small streams (nearly 1 in 2 headwater sites are impaired) and that impairment lessens significantly as sites drain larger areas (nearly 7 in 10 principal stream and small river sites are in full attainment). This phenomenon correlates well with the most widespread causes associated with aquatic life impairment in these watersheds.

Table G-3 and Figure G-4 depict the attainment status breakdown of the 3875 WAU sites collected from 2005-2014 by designated or recommended (existing) ALU. As would be expected, most sites (72 percent) are assigned the base warmwater habitat (WWH) ALU, for which attainment of biocriteria signifies meeting the fishable/swimmable goal of the Clean Water Act (CWA). For this cycle, about 53 percent of assigned WWH sites are meeting the WWH use. About 20 percent of the 3875 sites are assigned more protective ALUs (exceptional warmwater habitat-EWH, coldwater habitat-CWH or a dual use which includes both-EWH/CWH). The remaining sites (8 percent) are assigned “less than goal” CWA uses (MWH and LRW). Both more protective and “less than goal” uses are only assigned after a use attainability analysis has been conducted based on rigorous field data and this study determines that the assigned ALU is the most appropriate to protect existing high quality/unique biological communities or set reasonable restoration benchmarks for communities challenged by pervasive anthropogenic or natural influences. As might be expected, a high percentage of sites assigned to more protective uses

are fully meeting that use (84 percent) while those with assigned "less than goal" uses have low achievement of even the lower expectations of these uses (57 percent meet).

Table G-4 lists the top five ALU impairment causes for the period 2003 through 2014. For this time period, principal causes for HUC12 WAU impairments were those primarily related to landscape modification issues involving agricultural land use and urban development. These types of impairments would be most manifest in smaller streams, a fact backed up by the numbers presented in Table G-2. It is important to note that between 24 percent and 48 percent of impaired HUC12 WAUs had at least one monitored site impaired by one of these individual causes and many WAUs had several sites affected by three or more of the five causes listed as responsible for the ALU impairment. This would not be an unusual situation given the frequently close association between these impairment causes (e.g., nutrients, sedimentation/siltation, habitat modifications and hydromodifications in rural/agricultural landscapes relying on channelization and field tiles for drainage). Also of note is the prevalence of HUC12 WAUs and LRAUs which are impaired by the generic organic enrichment cause category; 30 percent of impaired WAUs show "sewage" related impairments such as high biochemical oxygen demand, elevated ammonia concentrations and/or in-stream sewage solids deposition. Eight of 20 impaired LRAUs also note sewage related causes. While the WAU percentage is not as high as reported in the 2014 IR, it is still comparable to those percentages reported in past IRs that tracked these cause statistics, which suggests that adequate treatment and disposal of human and animal wastes via wastewater treatment plants, home sewage treatment systems and land applications of septage and animal manure continue to be critical water quality issues in many Ohio watersheds.

Progress towards the "80 percent by 2020" ALU goal for Ohio's wading and principal stream and river sites (those monitored sites draining watersheds between 20 and 500 square miles) is depicted in Figure G-5. Contrasted with the 2010 IR statistic, when the 2020 goal benchmark was established, the percentage of qualifying sites in full attainment has increased nearly five percentage points with an increase from 61.4 percent to 66.1 percent. If this rate of change remains consistent over the next four years (*i.e.*, with new data collected through 2018), the statistic will approach 70 percent but will not reach the goal by the time the 2020 IR is produced. It is readily apparent that more proactive implementation of watershed recommendations in TMDL reports and watershed action plans (WAPs) will be needed to recover impaired aquatic communities and protect those currently meeting aquatic life expectations in order to meet the 80 percent goal. It will also be critical that resources be directed to follow-up monitoring in areas with implemented restoration and protection projects so that success of efforts can be documented and reflected in future goal statistics. This latter effort is now well underway in survey areas with TMDLs approved and implemented beginning in the late 1990s and is an ongoing activity in support of the Ohio EPA Nonpoint Source Program (see http://epa.ohio.gov/dsw/nps/index.aspx for more program information).

G3.3 Lake Erie Assessment Units (LEAUs)

For previous IRs, assessments were based on past data collected in the mid-1990s through the early 2000s. Significant changes appear to be ongoing in Lake Erie and, as a result, these older data are no longer being used to determine ALU attainment status in the three LEAUs. However, these data are used in the following discussion to highlight key trends in fish community condition over two time periods of sampling.

From 2011-2014, 116 fish community collections using night electrofishing methods (day electrofishing at two Sandusky Bay sites) were taken from 45 sites spread over the three LEAUs and these data serve

as the core data set for assessment of Lake Erie shoreline status. For this cycle, and despite the rather limited amount of data, the assessment methodology as used in past IRs was once again used to determine ALU status in the LEAUs. This included the average IBI and MIwb scores for all sampling passes available at a given sampling location which were then compared to target expectations based on the prevailing bottom substrate type at that location (hard bottoms, *e.g.*, bedrock, boulder, rubble or soft bottoms, *e.g.*, sand, silt, muck). Results for the IBI and MIwb scores at 31 shoreline sites (excluding Sandusky Bay and the Lake Erie Islands sites) compared to expectations are presented in Figures G-6 and G-7.

All three LEAUs remain Category 5 with significant impairment of sites due primarily to tributary loadings of nutrients and sediment, exacerbated by continued trophic disruptions caused by the proliferation of exotic species, algal blooms and shoreline habitat modifications. In the aggregate, only six fish community collections were assessed as fully attaining the designated EWH ALU; 14 were assessed as partially attaining and the remaining 25 were in non-attainment (Table G-1). With the exception of attainment results reported for the 2012 IR, when the size of the database was severely restricted, the percentages of sites in full attainment of the EWH ALU have not changed significantly through the IR cycles. One positive may be the increased percentage of sites in partial attainment, at the expense of non-attainment, for the last few cycles when compared to previous earlier cycles. All partial attainment sites were due to MIwb scores meeting expectations which may reflect better aggregated numerical abundance of fish, increased biomass and structural evenness, the latter being a product of species richness and the distribution of numbers and biomass among the various species.

A breakdown of results reflects the following site attainment status for each of the three LEAUs:

LEAU Name	# Sites	# Full	# Partial	# Non
Western Basin Shoreline (incl. Maumee and Sandusky bays)	19	5	7	7
Central Basin Shoreline	22	1	6	15
Lake Erie Islands Shoreline	4	0	1	3

Three of the six sites, with fish communities meeting ALU target expectations, were collected from Sandusky Bay with two full attainment sites collected from the western basin shoreline along the eastern extent of Maumee Bay (between Immergrun and Cedar Point) and one full attainment site along the West Harbor shoreline just to the west of the Cuyahoga River in Cleveland. At several partial attainment sites where MIwb scores were exceeding target expectations, IBI scores, while not quite meeting targets, were approaching acceptable scores. These shoreline locations were located in Sandusky Bay and near the Grand River, Ashtabula River and Conneaut Creek along Ohio's eastern end of the Central Basin.

For this IR, an attempt was made to compare the recent data set collected 2011-2014 to similar electrofishing results collected from co-located sites sampled in the 1990s and early 2000s. Resulting comparisons of Lake Erie IBI and MIwb scores by individual sampling passes at 45 sites and matching historical sites are presented in Figures G-8 and G-9. For the most part, there seemed to be little change in medians and ranges of these two indices at the sites spanning the two timeframes. The biggest changes appeared linked to Islands Shoreline sites but that may be more an artifact of the small sample sizes. One Lake Erie IBI component metric which did seem to reflect a significant change across the two timespans was the proportion of exotic species by numerical abundance in each sampling pass (Figure G-10). For Lake Erie, typical common exotic species which can be collected using the electrofishing

sampling method include round and tube nose goby, white perch, ghost shiner, gizzard shad, common carp and goldfish. Initial assessment of 2011-2014 results implicates large populations of white perch and gizzard shad as the culprits causing the proportional increases in exotic species collected when compared to earlier collections.

Table G-1. Summary of ALU assessment for Ohio's WAUs[2], LRAUs and LEAUs: 2002-2016 IR cycles.

IR Cycle	2002 (1991-2000)	2004 (1993-2002)	2006 (1995-2004)	2008 (1997-2006)	2010 (1999-2008)	2012 (2001-2010)	2014 (2003-2012)	2016 (2003-2014)
HUC11 Watershed AUs (331)								
No. AUs Assessed (% of total)	224 (68%)	225 (68%)	212 (64%)	218 (66%)	221 (67%)	-	-	-
No. Sites Assessed	3272	3620	3785	4030	4200	-	-	-
Average AU Scores								
Full Attainment	**46.6**	**48.3**	**52.5**	**54.7**	**58.5**	**-**	**-**	**-**
Partial Attainment	25.2	23.6	22.6	22.4	21.2	-	-	-
Non-Attainment	28.2	28.1	24.9	22.9	20.3	-	-	-
HUC12 Watershed AUs (1538)								
No. AUs Assessed (% of total)[3]	-	-	-	-	999 (65%)	908 (59%)	933 (61%)	983 (64%)
No. Sites Assessed	-	-	-	-	4200	3867	3876	3875
Average AU Score[4]	-	-	-	-	**56.7**	**57.7**	**59.2**	**61.5**
% Sites Full Attainment	-	-	-	-	55.1	57.0	57.8	59.3
% Sites Partial Attainment	-	-	-	-	20.0	21.6	22.3	20.7
% Sites Non-Attainment	-	-	-	-	24.9	21.4	19.9	20.0
Large River AUs (23 rivers/38 AUs totaling 1247.54 Miles)								
No. Rivers/AUs Assessed	22	21	17	16	18/30	18/31	22/37	23/38
No. Sites Assessed	422	425	374	278	265	312	332	358
No. Miles Assessed (% of total)	905 (70%)	918 (71%)	873 (68%)	850 (66%)	852 (69%)	984 (80%)	1147 (92%)	1216 (98%)
% Miles Full Attainment	**62.5**	**64.0**	**76.8**	**78.7**	**93.1**	**89.0**	**89.2**	**87.4**
% Miles Partial Attainment	23.0	21.4	15.1	13.9	5.5	7.5	6.3	8.7
% Miles Non-Attainment	14.5	14.6	8.1	7.4	1.4	3.5	4.5	3.9
Lake Erie AUs (3)								
No. AUs Assessed	3	3	3	3	3	3	3	3
No. Sites Assessed[5]	92	111	93	49	34	23	38	45
% Sites Full Attainment	**12.0**	**18.0**	**19.4**	**10.2**	**14.7**	**30.4**	**13.2**	**13.3**
% Sites Partial Attainment	13.0	14.4	16.1	22.4	17.7	30.4	34.2	31.1
% Sites Non-Attainment	75.0	67.6	64.5	67.4	67.6	39.2	52.6	55.6

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2 WAUs for the IR 2002-2010 cycles were based on HUC11s; WAUs transitioned to HUC12s for cycles beginning with 2010.

3 2010 statistics based on direct assessment of HUC12 AUs with data collected between 2005 and 2008 (n=545) and HUC11 extrapolated assessment of HUC12 AUs with data collected between 1998 and 2004 (n=454). 2012, 2014 and 2016 IR assessments based on direct assessment of HUC12 AUs with data collected between 2001 and 2010 (n=908), 2003 and 2012 (n=933) and 2005 and 2014 (n=983), respectively.

4 Statistic based on the average of available AU scores with current data, derived as explained in Section G2.2.

5 Data for sites used in the 2002-2012 IR cycles were generally collected between 1993 and 2002; for the 2014 and 2016 IRs, data were collected 2011-2014.

Table G-2. Breakdown by watershed size category of sites in full, partial and non-attainment in monitored WAUs (983 HUC12s) based on data collected from 2005-2014.

Watershed Size Category (mi^2)	# of Sites (% of total)	Number of Sites in Full Attainment (%)	Number of Sites in Partial Attainment (%)	Number of Sites in Non-Attainment (%)
0-20 (headwater)	2267 (58.5)	1233 (54.4)	466 (20.5)	568 (25.1)
20-50 (wading)	634 (16.4)	387 (61.0)	144 (22.7)	103 (16.3)
50-500 (principal)	974 (25.1)	676 (69.4)	193 (19.8)	105 (10.8)
Total	3875	2296 (59.3)	803 (20.7)	776 (20.0)

Table G-3. Breakdown by designated or recommended ALU of sites in full, partial and non-attainment in monitored WAUs (983 HUC12s) based on data collected from 2005-2014.

ALU	# of Sites (% of total)	Number of Sites in Full Attainment (%)	Number of Sites in Partial Attainment (%)	Number of Sites in Non-Attainment (%)
EWH	456 (11.8)	370 (81.1)	81 (17.8)	5 (1.1)
EWH/CWH	85 (2.2)	76 (89.4)	6 (7.1)	3 (3.5)
CWH	210 (5.4)	182 (86.7)	15 (7.1)	13 (6.2)
WWH	2800 (72.3)	1482 (52.9)	664 (23.7)	654 (23.4)
MWH	253 (6.5)	157 (62.1)	37 (14.6)	59 (23.3)
LRW	71 (1.8)	29 (40.8)	-	42 (59.2)
Total	3875	2296 (59.3)	803 (20.7)	776 (20.0)

- EWH: exceptional warmwater habitat; CWH: coldwater habitat; WWH: warmwater habitat; MWH: modified warmwater habitat; LRW: limited resource water
- Bold text indicates use that meets the minimum fishable/swimmable goal of the Clean Water Act.
- Bold/italics text indicates use that exceeds the minimum fishable/swimmable goal of the Clean Water Act.
- Plain text indicates "less than goal" use that does not meet the minimum fishable/swimmable goal of the Clean Water Act.

Table G-4. Prevalence of the top five causes of aquatic life impairment in watershed and LRAUs based on biological and water quality survey data collected from 2003-2014.

Assessment Unit (AU)	#	Number and Percentage of Monitored AUs with Impaired ALU Listed with a Top Five Cause of Impairment*				
		Siltation/ Sedimentation	Habitat Modification	Nutrient Enrichment	Organic Enrichment	Hydomodification
Watershed	**1,538**					
Monitored 2005-2014	983	304 (48%)	226 (35%)	221 (35%)	190 (30%)	151 (24%)
Impaired ALU	638					
No impairment	345					
Large River	**38**					
Monitored 2003-2014	38	7 (35%)	8 (40%)	8 (40%)	8 (40%)	8 (40%)
Impaired ALU	20					
No impairment	18					

* Listed as an ALU impairment cause for at least one stream within the watershed AU or one reach within the LRAU

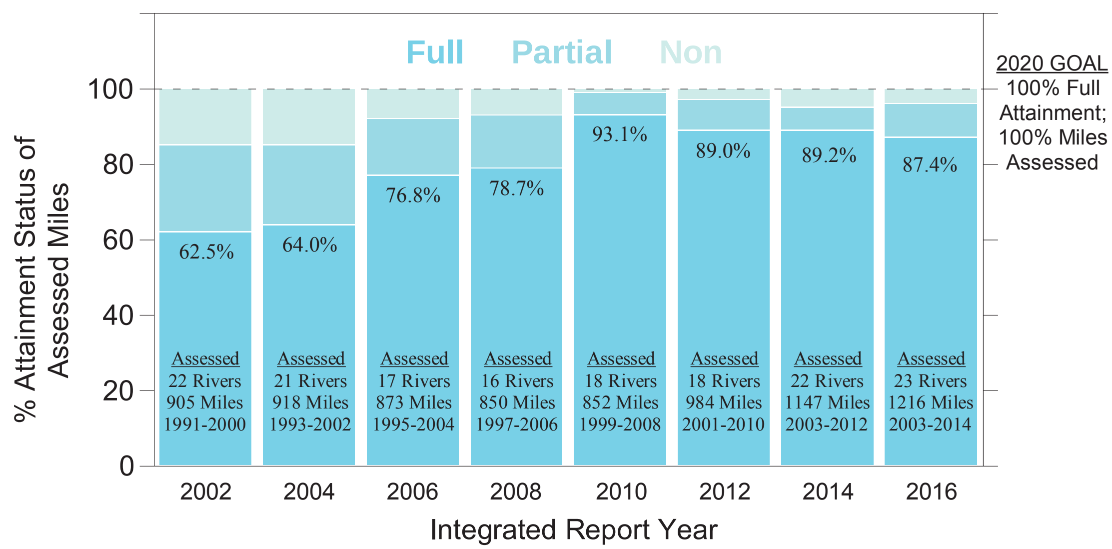

Figure G-2. Percent attainment status and goal progress ("100% by 2020") for monitored miles of Ohio's LRAUs (23 rivers/38 AUs/1247.54 miles total).

Note: Data compiled over the last eight IR cycles with the current 2016 cycle including data collected from 2003-2014.

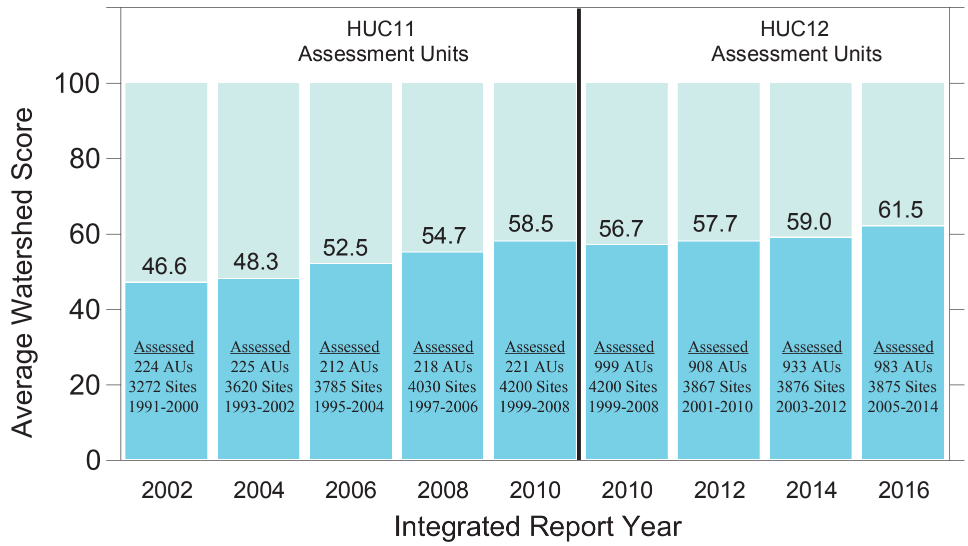

Figure G-3. Average full attainment watershed score for monitored Ohio HUC11 WAUs (IR cycles 2002-2010) and HUC12 WAUs (IR cycles 2010-2016).
Note: Data compiled over the last eight IR cycles with the current 2016 cycle including data collected primarily from 2005-2014.

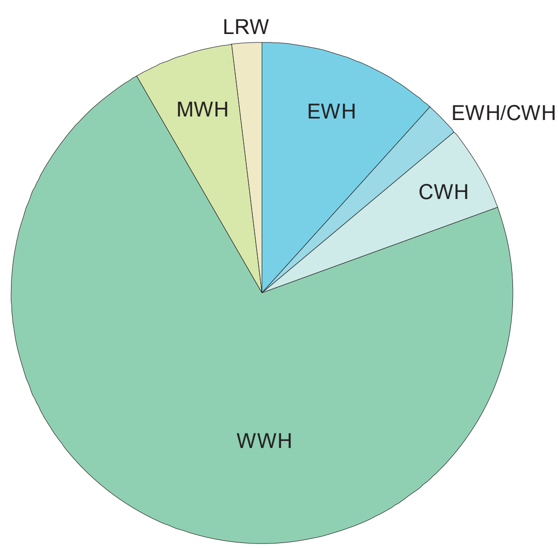

Figure G-4. Breakdown by designated or recommended ALU of sites in monitored WAUs (983 HUC12s) based on data collected primarily from 2005-2014 (n= 3875 sites).

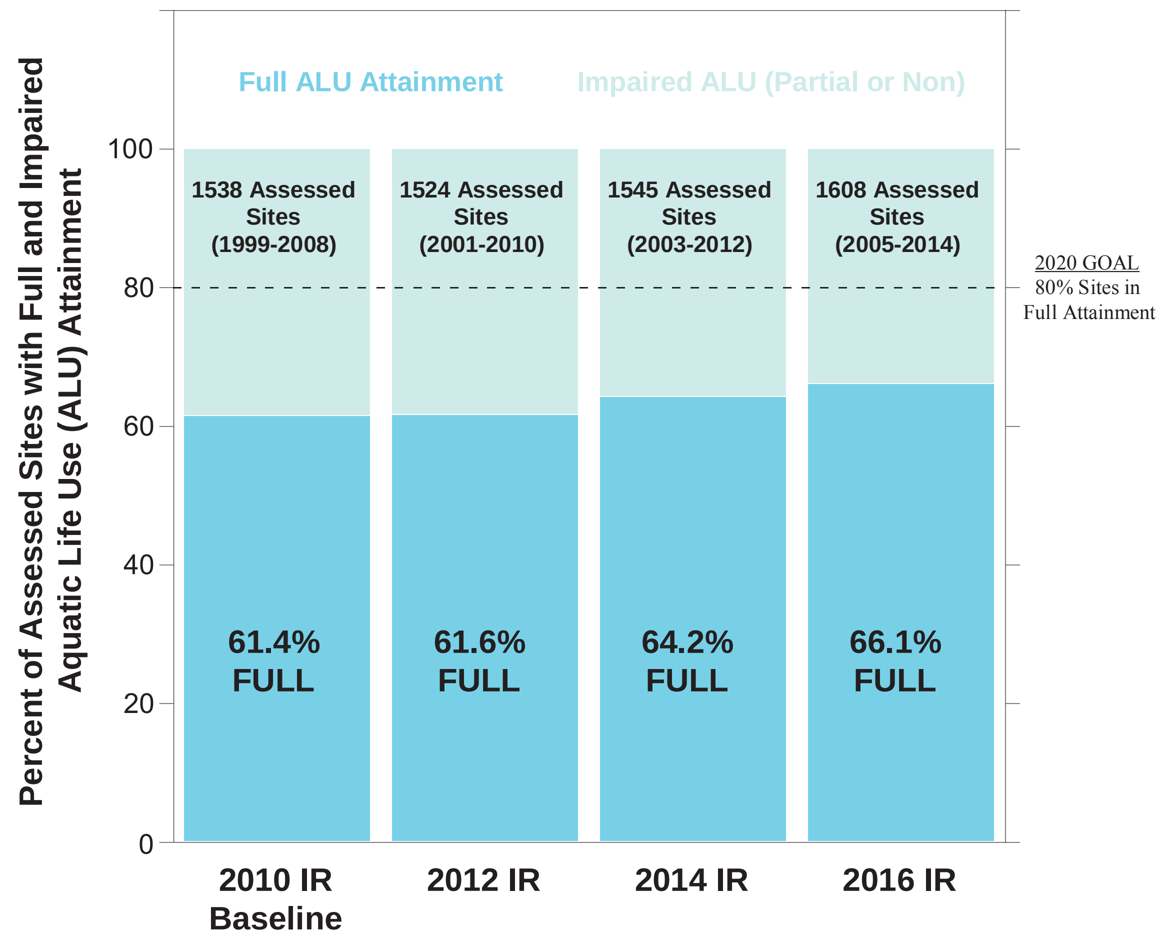

Figure G-5. Status and trend of ALU "80% by 2020" goal for wading and principal stream and river sites in Ohio based on the last four IR cycles.

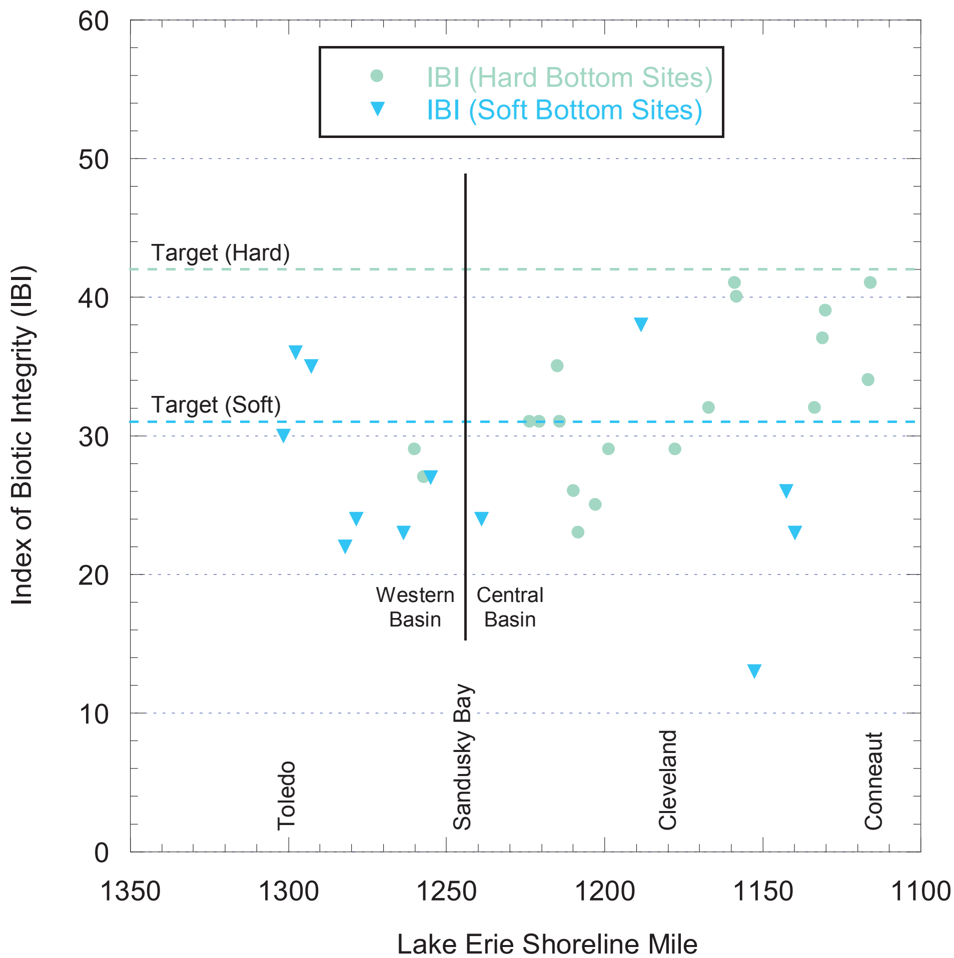

Figure G-6. Average IBI scores compared to habitat-scaled targets based on sampling passes available for sites along the Lake Erie shoreline from Toledo to Conneaut, 2011-2014. Figure does not include average IBI scores for Sandusky Bay or Lake Erie Islands shoreline sites.

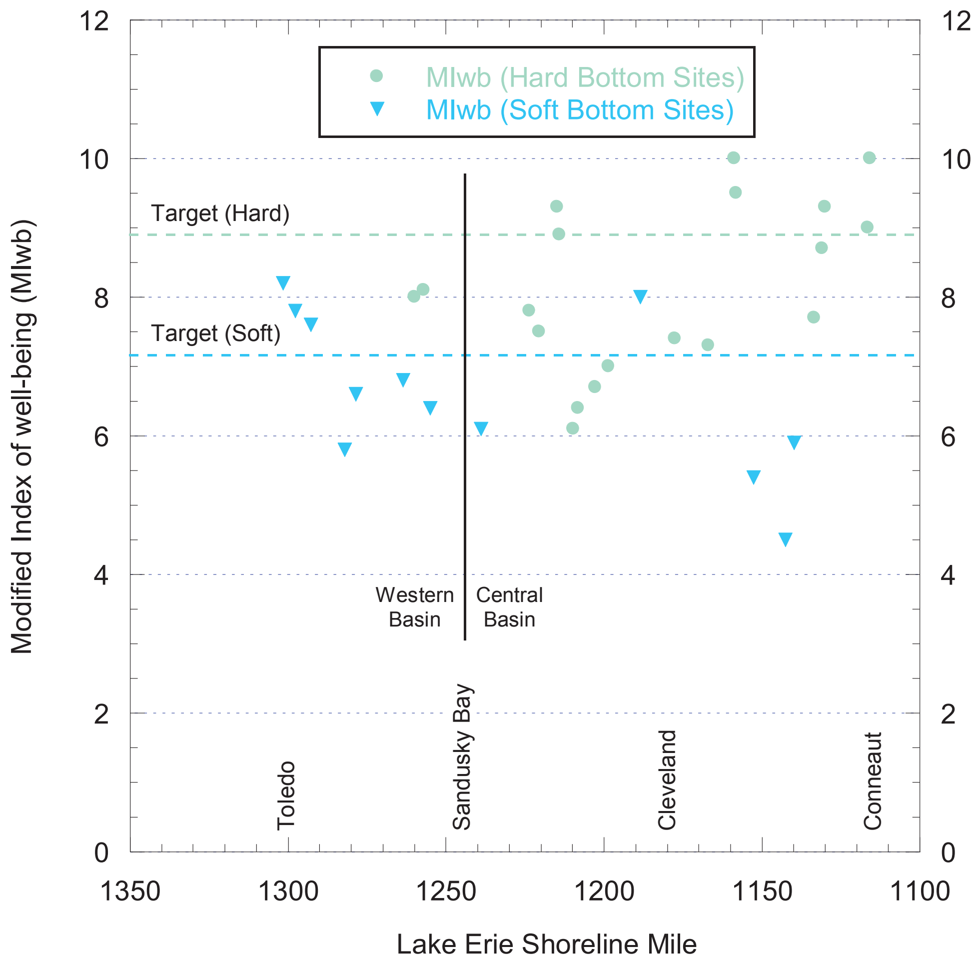

Figure G-7. Average MIwb scores compared to habitat-scaled targets based on sampling passes available for sites along the Lake Erie shoreline from Toledo to Conneaut, 2011-2014. Figure does not include average MIwb scores for Sandusky Bay or Lake Erie Islands shoreline sites.

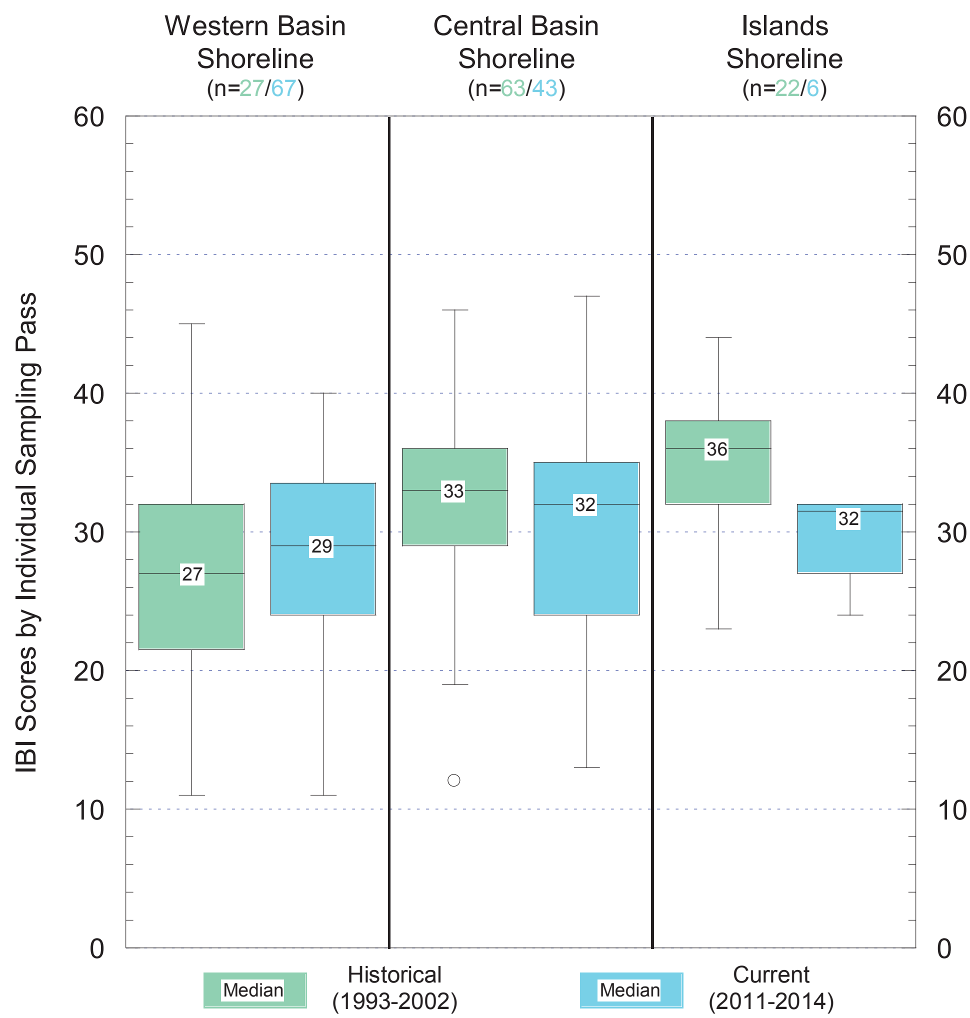

Figure G-8. Comparison of IBI scores for individual electrofishing sampling passes at 45 Lake Erie shoreline sampling locations collected 2011-2014 and at co-located sampling locations collected 1993-2002.

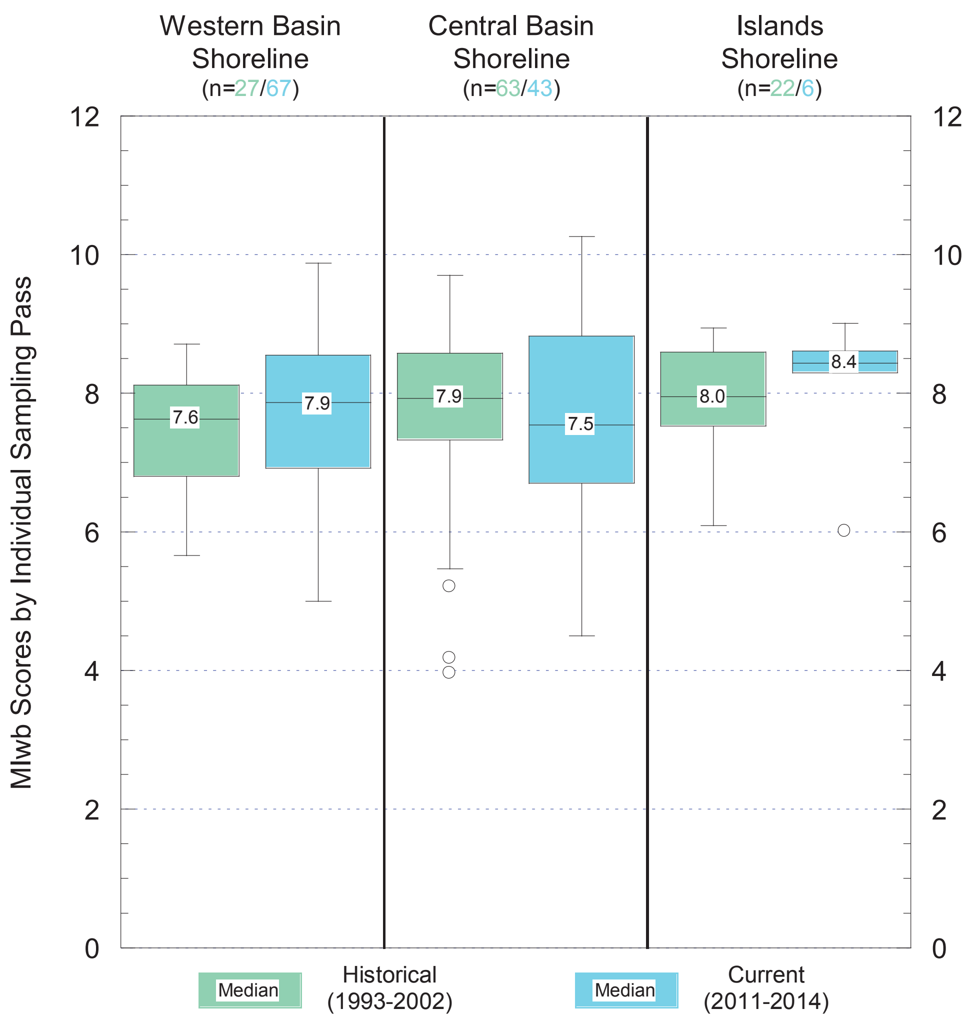

Figure G-9. Comparison of MIwb scores for individual electrofishing sampling passes at 45 Lake Erie shoreline sampling locations collected 2011-2014 and at co-located sampling locations collected 1993-2002.

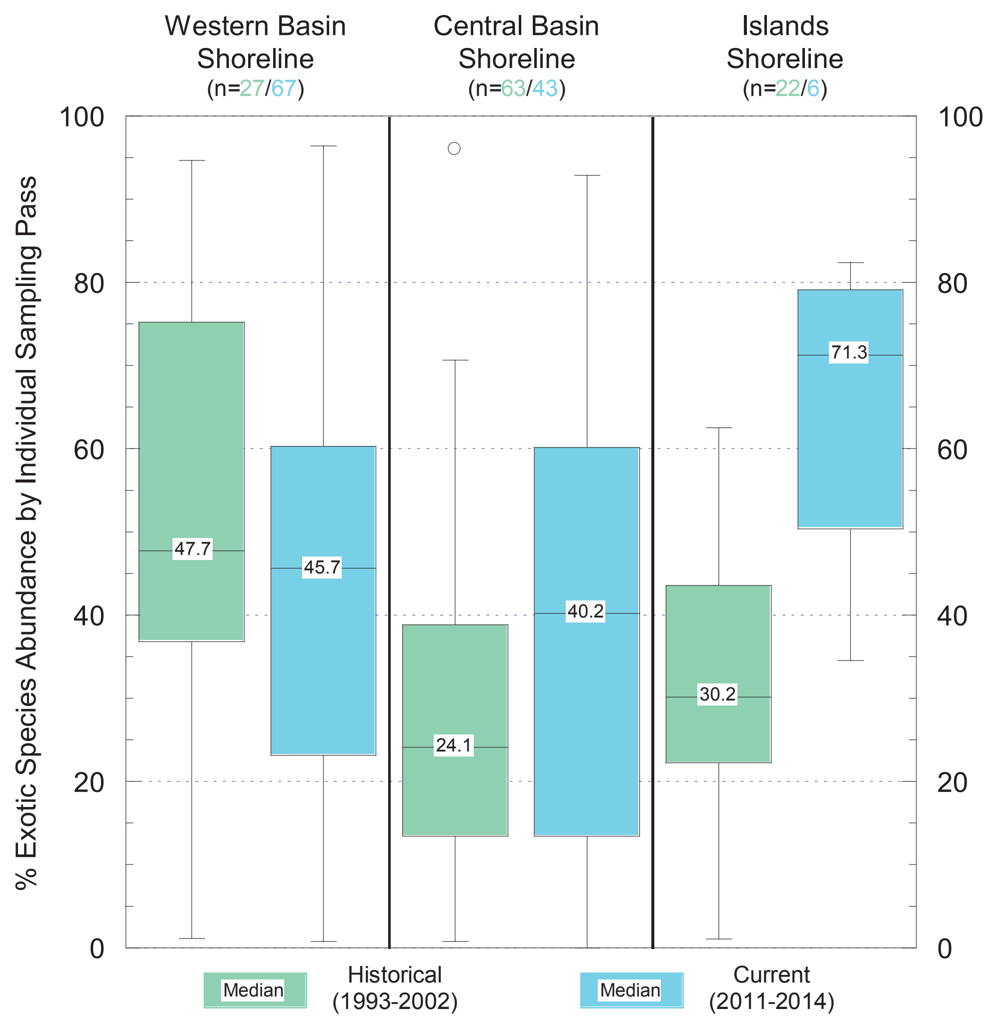

Figure G-10. Comparison of exotic species abundance as a proportion of total catch for individual electrofishing sampling passes at 45 Lake Erie shoreline sampling locations collected 2011-2014 and at co-located sampling locations collected 1993-2002.

Evaluating Beneficial Use:
Public Drinking Water Supply

H1. Background

The 2016 Integrated Report (IR) is the fifth reporting cycle to include assessment of the public drinking water supply (PDWS) beneficial use. Ohio continues to look for connections between Clean Water Act and Safe Drinking Water Act (SDWA) activities and leverage the programs to clean up and protect drinking water sources. Acknowledgement of the public water supply use and identification of impaired waters provides an effective issue in which to engage the public and stakeholders in watershed-wide planning and implementation activities. Conversely, the public water systems can be effective partners in these efforts and stand to benefit through reduced treatment costs, reduced risk to human health and credits toward achieving compliance with new SDWA regulations via source water controls in the watershed.

Assessments for each public water system were completed for nitrate, pesticide and algae (cyanotoxin) indicators. Assessments included in this cycle are based primarily on treated water quality data and to a limited extent other source water quality data available from Ohio EPA and external sources. Information used to complete assessment determinations include public water system treatment information, intake location, number and type of reservoirs and water quality data. Assessments were completed for stream sources, in-stream impounded reservoir sources and upground reservoirs with active drinking water intakes. Figure H-1 identifies Ohio watershed assessment units (WAUs) and large river assessment units (LRAUs) that contain surface waters currently utilized as drinking water sources by a public water system. WAUs correspond to 12-digit hydrologic unit codes. Three public water systems had intakes go inactive since the last reporting period, including MWCD-Atwood Park (Atwood Lake Intake); Cadiz (Sparrow Reservoir Intake); and Fremont (Sandusky River No. 2 Intake). The WAUs associated with Fremont and MWCD-Atwood Park utilize other active intakes and are assessed in the 2016 reporting period. The WAU associated with Cadiz (Sparrow reservoir intake) was not assessed.

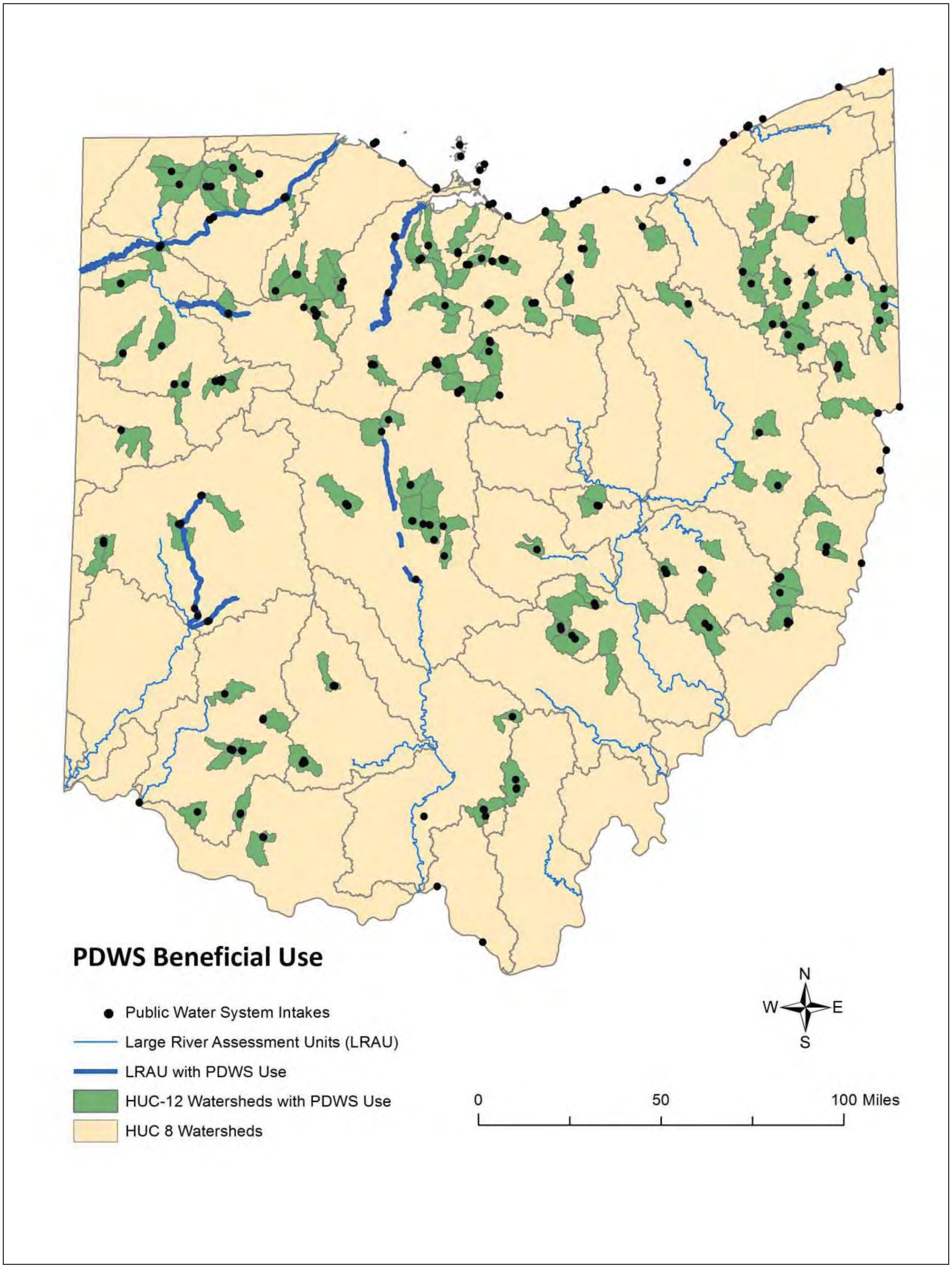

Figure H-1. Ohio WAUs and LRAUs that contain at least one active surface water drinking water intake.

H2. Evaluation Method

The methodology for assessing the PDWS beneficial use was first presented in the 2006 Integrated Water Quality Monitoring and Assessment Report. Updates to the methodology were included in subsequent IRs. The methodology used for this reporting cycle, including the use of an algae indicator, is described in this section. For more detail on how the method was first developed and rationale for indicator selection and exclusion, please refer to the initial methodology at http://www.epa.ohio.gov/portals/35/tmdl/2006IntReport/IR06_app_C_PDWSmethodology.pdf.

H2.1 Beneficial Use Designation

The PDWS use designation is defined in paragraph (B)(3) of OAC rule 3745-1-07. It applies to public waters that, with conventional treatment, will be suitable for human intake and meet federal regulations for drinking water. Although not necessarily included in rules 3745-1-08 to 3745-1-30 of the Ohio Administrative Code, the bodies of water with one or more of the following characteristics are designated public water supply by definition:

- All publicly owned lakes and reservoirs, with the exception of Piedmont reservoir;
- All privately owned lakes and reservoirs used as a source of public drinking water;
- All surface waters within 500 yards of an existing public water supply surface water intake; and
- All surface waters used as emergency water supplies.

Ohio EPA is focusing assessment efforts and limited resources on water bodies currently serving as public drinking water sources. Water bodies with inactive drinking water intakes that are being maintained as an emergency source of drinking water will also be assessed. Assessments for waters designated with the PDWS use but not currently used as a drinking water source are considered a lower priority and will likely be assessed only when water quality data is available.

Attainment determinations will apply to hydrologic assessment units (AUs) as defined by Ohio EPA's Division of Surface Water (DSW). For inland rivers the assessment unit is defined as the 12-digit hydrologic unit code (HUC 12) or the large river assessment unit. Lake Erie beneficial use assessments apply to the corresponding Lake Erie shoreline assessment unit. Although this beneficial use designation applies to a 500-yard zone surrounding the intakes, the attainment determination will be associated with the corresponding hydrologic assessment unit and factor into the 303(d) priority listing determination for impaired waters.

H2.2 Water Quality Standards

Water quality standards are designed to protect source water quality to the extent that public water systems can meet the finished water SDWA standards utilizing only conventional treatment. Source water quality will be assessed though comparison of in-stream and applicable treated water quality data to numeric chemical water quality criteria for the core indicators: nitrate; pesticides and other contaminants; and *Cryptosporidium* (following criteria development). The numeric water quality criteria correspond to the maximum contaminant levels established by the SDWA or were adopted from U.S. EPA's 304(a) recommended water quality criteria. Criteria will apply as average concentrations except for nitrate. At elevated levels, nitrate can cause acute health effects and the SDWA finished water standard applies as a maximum concentration not to be exceeded. Consequently, the water quality

criteria for nitrate will be applied as a maximum value. Annual time-weighted mean pesticide concentrations were calculated by taking the annual average of the quarterly averages and comparing to the water quality criteria.

An additional core indicator based on algae and associated cyanotoxins was incorporated into the assessment methodology for the 2014 IR. It is based on the aesthetic narrative criteria for algae described in OAC rule 3745-1-07 and uses cyanotoxins as an indicator of algae impairment. The State of Ohio developed numeric cyanotoxin drinking water thresholds for microcystins, saxitoxins, anatoxin-a and cylindrospermopsin in 2011 (See 2014 *State of Ohio Public Water System Harmful Algal Bloom Response Strategy* available at http://www.epa.ohio.gov/Portals/28/documents/PWS_HAB_Response_Strategy_5-30-12.pdf). These thresholds are the basis for all cyanotoxin indicators of impairment. In 2015, U.S. EPA released Health Advisory concentrations for microcystins and cylindrospermopsin, which Ohio EPA adopted in the 2015 State of Ohio Public Water System Harmful Algal Bloom Response Strategy. In 2016, Ohio EPA adopted the U.S. EPA Health Advisories for microcystins and established microcystins monitoring and reporting requirements in rule. Ohio EPA plans on reviewing the algae impairment assessment methodology prior to the next reporting cycle to determine potential incorporation of U.S. EPA's cyanotoxin health advisories and revisions to the indicators of impairment. Since cyanotoxin thresholds are based on acute or short-term exposures, the criteria are based on a maximum concentration not to be exceeded. Cyanotoxins have been detected in sources of drinking water since 2009, but were not detected above drinking water thresholds in finished water until 2013. Finished water detections at Carroll Township in 2013 and at Toledo in 2014 led to the issuance of "Do Not Drink" advisories due to cyanotoxins. The Toledo advisory affected almost half a million people and underscores the need for PDWS use assessments to consider algae impacts. Possible future algae indicators include: Total Trihalomethanes (TTHMs) or Haloacetic Acids (HAA5) MCL violations; elevated total organic carbon (TOC); taste and odor events; and additional treatment or source control requirements associated with algae impacts.

H2.3 Attainment Determination

Each assessment will result in identification of one of three attainment categories: Impaired, Full Attainment and Not Assessed-Insufficient Data. For AUs with multiple PDWS zones, the attainment statuses of all zones are combined and the lowest attainment status applied to determine the PDWS assessment status for the entire assessment unit. That is, the overall AU status is considered "Impaired" if any of the PDWS zones have an impaired attainment status. Conversely, the overall assessment status for the AU could be listed as "Full Support" only if sufficient data for at least the nitrate indicator was available to determine the attainment status for all PDWS zones within the AU.

The following table displays some potential scenarios that might occur within an assessment unit, either with one PDWS zone or multiple zones. In each case, the reverse situation of what is shown might occur (e.g., for the first row, full support of the first indicator and insufficient data for the second indicator would result in an AU assessment status of insufficient data).

Nitrate Indicator	Pesticide or Other Indicator	AU Assessment Status
Full support	Full support/Insufficient data	Full support
Full support	Impaired	Impaired
Impaired	Insufficient data/Full Support	Impaired
Insufficient data	Impaired	Impaired
Insufficient data	Insufficient data/Full Support	Insufficient data

AUs are further evaluated for water quality conditions placing them on a "watch list." Source waters are placed on the "watch list" where water quality was impacted, but not at a level that indicates impairment[1]. Waters may remain on the watch list based on historical data, if current raw water data or applicable finished water quality data are not available. While these waters are still considered in full attainment of the PDWS use, they will be targeted for additional monitoring and more frequent assessment, if resources are available. Table H-1 identifies impaired and "watch list" water quality conditions.

Table H-1. PDWS attainment determination.
Applies to ambient and treated water quality data from 2010 through December 2015.

Indicator	Impaired Conditions
Nitrate	☐ Two or more excursions[a] above 10.0 mg/L within the 5-year period
Pesticides	☐ Annual average exceeds WQ criteria (atrazine = 3.0 µg/L)
Other Contaminants	☐ Annual average exceeds WQ criteria
Algae: Cyanotoxins[b]	☐ Two or more excursions[a] above the state drinking water thresholds (microcystins = 1.0 µg/L) within the 5-year period
Cryptosporidium[c]	☐ Annual average exceeds WQ criterion (1.0 oocysts/L)
Indicator	**Full Attainment Conditions**
Nitrate	☐ No more than one excursion[a] above 10.0 mg/L within the 5-year period
Pesticides	☐ Annual average does not exceed the WQ criteria (atrazine = 3.0 µg/L)
Other Contaminants	☐ Annual average does not exceed the WQ criteria
Algae: Cyanotoxins	☐ No more than one excursion[a] above the state drinking water thresholds (microcystins = 1.0 µg/L) within the 5-year period
Cryptosporidium	☐ Annual average does not exceed the WQ criterion
Indicator	**"Watch List" Conditions** *Source waters targeted for additional monitoring and assessment*
Nitrate	☐ Maximum instantaneous value > 8 mg/L (80% of WQ criterion)
Pesticides	☐ Running quarterly average ≥ WQ criteria ☐ Maximum instantaneous value ≥ 4x WQ criteria
Other Contaminants	☐ Maximum instantaneous value ≥ WQ criteria
Algae: Cyanotoxins	☐ Maximum instantaneous value ≥ 50% of the state drinking water thresholds
Cryptosporidium	☐ Annual average ≥ 0.075 oocysts/L

[a] Excursions must be at least 30 days apart in order to capture separate or extended source water quality events.
[b] Impaired conditions based on source water detections at inland public water systems and detections at public water system intakes for Lake Erie source waters. Cyanotoxins include: microcystins, saxitoxins, anatoxin-a and cylindrospermopsin.
[c] Impaired conditions for *Cryptosporidium* are based on water quality criteria that Ohio EPA intends to develop.

[1] Impaired waters may also be on a watch list for an indicator for which they are not impaired. For instance, the Beaver Creek watershed (04100011-12-02) is impaired for algae, but is on the watch list for nitrates.

H2.4 Data Sources and Requirements

In order to capture current water quality conditions, these assessments have traditionally focused on the most recent five years of data. However, for the 2016 IR, the eligible data timeframe for this beneficial use only was expanded to incorporate the most recent six years of data and include the 2015 results. The 2016 PDWS use impairment list was developed using public water system compliance monitoring treated data and ambient water quality data from January 2010 through December 2015. Water quality data were requested and obtained from the Syngenta Crop Protection, Inc. Atrazine Monitoring Program (AMP; 2010-2014). Treated water quality data were obtained from the Safe Drinking Water Information System (SDWIS) database, which contains all SDWA compliance data submitted to the Division of Drinking and Ground Waters (DDAGW) by Ohio public water systems and their certified laboratories. Raw water quality data from samples collected near intakes were obtained from the DSW's ambient monitoring database and level 3 credible data collected and submitted by level 3 qualified data collectors. Additional raw water quality data were collected by DDAGW at intake locations within DSW watershed surveys. Cyanotoxin data were retrieved from Ohio EPA's Harmful Algal Bloom database.

Treated water quality data could only be used for the assessments if the water system did not blend with ground water, selectively pump from the stream source to an upground reservoir to avoid contamination, or use a nitrate or pesticide removal treatment process. A significant number of water systems use activated carbon during the water treatment process, which precludes use of the treated pesticide data for PDWS assessments and leads to a significant number of assessments completed with nitrate data only.

To assure that surface water samples are representative of the source water, the following sampling guidance was followed:

- Preferred sampling location was within the 500-yard PDWS zone or directly at the intake. Samples collected at the treatment plant raw water line were also considered representative.
- Data collected upstream from the intake beyond the 500-yard zone were utilized if there were no significant hydrologic or water quality changes between the sample location and the intake. Dams, channel modification, tributaries with significant flow or contaminant sources were assumed to significantly alter in-stream water quality and limit applicability of farther upstream sampling data.
- For PDWS lakes and reservoirs with known stratification or seasonal turnover, the preferred data collection location was either the raw water intake line or in the lake at the same depth or zone as the raw water intake screen(s). Surface sampling data collected at the intake were utilized if no other raw water data were available.

PDWS attainment determinations based on small sample sets present several challenges. The small sample set may fail to identify an exceedance of a water quality standard, resulting in a determination of attainment when in fact an area is impaired. Statistical confidence in the determination decision is also reduced. To address these concerns, the assessment looks at multiple lines of evidence including several sources of water quality data and treatment plant information. The attainment decision target sample size is 20 samples collected within the past five years. This sample count will provide sufficient power to detect exceedances of greater than or equal to 15 percent above the criterion with a Type I error of 0.15. Ohio EPA has limited resources for source water sampling, therefore attainment determinations may be concluded with a minimum of 10 samples if these samples represent the critical

period when the contaminant is typically detected. Attainment decisions may also be made with less than the required sample count when there is overwhelming evidence of impairment, such as a large single sample exceedance of nitrate or microcystins (verified with a repeat sample).

Many source water contaminants occur in surface waters seasonally with maximum concentration in early spring through summer. In order to assure that sampling for nitrates and pesticides accurately characterizes these seasonal fluxes, at least 50 percent of the samples are collected from the period March to August with at least two years represented. The critical sampling time for cyanotoxins is late spring through fall (May to November). In order to minimize dataset seasonal bias, any impairment determination based on exceedance of a mean water quality criterion requires a minimum of 10 samples representing at least two seasons. If a large dataset is available with sample collection skewed toward high flow events (i.e., stratified sampling program), it may be necessary to calculate time-weighted seasonal or monthly average values.

Most of the nitrate assessments were completed with sufficient samples and well over the recommended minimum sample counts. Much lower sample counts for pesticides were available and several assessments were completed with fewer than 10 samples. Use of fewer than 10 samples were allowed if the samples were collected from at least two separate years, the samples were all within the spring runoff period (typically March through June) and all results were well below (all results less than 50 percent) the water quality criteria. Exception to the ten sample minimum was also allowed if the PDWS zone was in an area with minimal atrazine application, all samples were also below the criteria and available samples were collected during the spring runoff period when occurrence is most likely.

To provide additional information within the “Not Assessed” reporting category 3, “i” was added to note when some water quality data were available but not enough to complete an assessment. A determination was also made to retain all impaired listings until sufficient valid data were obtained to justify delisting.

The impaired status will remain until there are five consecutive years without any excursions and sufficient raw water data are obtained. The same number of samples required to list an AU as impaired due to nitrate, pesticides or algae will be required to delist the AU.

For the 2016 assessment cycle, only the nitrate, pesticide and algae (cyanotoxin) indicators were evaluated in-depth. Other contaminants monitored by the public water systems for SDWA compliance and reported in the SDWIS database were also reviewed but no in-stream raw water data were evaluated for these contaminants. All available *Cryptosporidium* data from SDWA compliance monitoring were reviewed for this assessment cycle, but the water quality criteria have not yet been established and no impairment determinations could be made based on this parameter.

H2.5 Ohio River Assessments

The Ohio River Valley Water Sanitation Commission (ORSANCO) evaluates the PDWS use for Ohio River intakes and present assessments in the Biennial Assessment of Ohio River Water Quality Conditions Report. ORSANCO is an interstate agency that was created in 1948 to control and abate pollution in the Ohio River Basin. ORSANCO operates programs to monitor, assess and improve water quality within the basin. Consequently, Ohio EPA will not assess the PDWS use for intakes located on the Ohio River. ORSANCO’s water quality standards are available at the commission’s website: http://www.orsanco.org.

H3. Results

Using the PDWS assessment methodology and available water quality data, results for the PDWS beneficial use are presented here for all WAUs, LRAUs and Lake Erie AUs (LEAUs) where the PDWS use applies. Applicable water quality data were evaluated to determine an impairment status for each key indicator in each AU. In order to be considered "assessed," sufficient data were required for only the nitrate indicator. There are a total of 119 public water systems using surface water (excluding Ohio River intakes) in 123 separate AUs. The 123 AUs with the PDWS beneficial use include the following: 111 WAUs, nine LRAUs and all three LEAUs. A summary of the nitrate, pesticide and algae (cyanotoxin) indicators for each public water system are presented in Section H4. Table H-2 provides supporting information for each of the 29 AUs listed as impaired for the PDWS beneficial use.

Nitrate Indicator. Sufficient data were available to complete nitrate evaluations for 53 (43 percent) of the 123 AUs using data primarily from Ohio EPA's compliance database and Ohio EPA watershed surveys. Of all 123 AUs, five (4 percent) were identified as impaired and 48 (39 percent) were in full support. Impairments included four of the nine LRAUs. Three Maumee River and one Sandusky River LRAU remain impaired. Most of the 27 waters placed on the nitrate watch list (single detection greater than eight mg/L) are located in the northwest part of the state (Figure H-2).

Ohio EPA is working with U.S. EPA to develop a total maximum daily load (TMDL) report that addresses nitrate impacts to all three of the PDWS impaired Maumee River LRAUs. The Maumee River is the source water for five public water supplies.

Pesticide Indicator. Sufficient data were available to complete atrazine evaluations for 26 (21 percent) of the 123 PDWS AUs using data from Ohio EPA's compliance database (treated water), Ohio EPA water quality surveys and Syngenta Crop Protection, Inc.'s AMP. Five of the WAUs were impaired while the remaining 19 were in full support. For LRAUs, five remained on the watch list from the previous report cycle. A total of 24 waters were placed on the pesticide watch list because of elevated atrazine [single exceedance of four times the water quality criteria (WQC) or quarterly average greater than WQC]. These areas of elevated atrazine coincide with the predominantly agricultural land use in western and northwestern Ohio (Figure H-3).

In response to the atrazine drinking water use impairment on Sterling Run, Ohio EPA, through a U.S. EPA contractor developed Ohio's first TMDL report specifically for a public water supply. The White Oak Creek watershed TMDL report, which includes Sterling Run, prepared TMDLs for atrazine, fecal coliform, nitrate+nitrite, total suspended solids, total phosphorus and ammonia. In 2009, a Clean Water Act Section 319 grant was awarded that funded atrazine reduction best management practices in the Sterling Run subwatershed. The final TMDL report was approved by U.S. EPA on February 25, 2010.

Ohio EPA is in the process of developing a TMDL report that address atrazine impacts to Swift Run Lake, which is the public water supply source water for the City of Piqua.

Algae (cyanotoxin) Indicator. Since the end of the last report cycle, incidents of harmful algal blooms (HABs) impacting Ohio public drinking water supplies have greatly increased. Algal toxin sample data collection has also increased in response to these incidents. This has included both Ohio EPA data collection and public water system data collection efforts. From 2010 – 2015, more than 3,700 algal toxin samples have been collected and analyzed from Ohio PDWS intakes.

Sufficient data were available to list 19 AUs (15 percent) as impaired. The impairment listing includes the entire Lake Erie Western Basin shoreline, Lake Erie Central Basin shoreline and Lake Erie Island shoreline AUs. In addition, 15 WAUs are now assessed as impaired. While microcystin is the predominant cyanotoxin impacting attainment determinations, saxitoxin has been found responsible for impairment in two WAUs. An additional 19 AUs were also placed on the watch list. With the passage of new HAB rules in Ohio in 2016, data to assess all 123 PDWS AUs will be available for the next IR report cycle.

WAUs that are impaired or on the watch list for cyanotoxins are found distributed across Ohio virtually in every geographic region (Figure H-4).

***Cryptosporidium* Indicator.** Since Ohio EPA has not yet formalized water criteria for *Cryptosporidium*, assessment of this indicator could not be included in this report nor used for Ohio's 2016 303(d) listings. Ohio EPA requested all available *Cryptosporidium* data from U.S. EPA and summarized the results to demonstrate how the data would be evaluated using the PDWS assessment methodology.

Cryptosporidium data are available for 124 public water systems. This dataset included samples collected from 2006 to 2012 in order to fulfill new SDWA regulations that require the water systems to submit 24 to 47 samples over a two-year period. Round 1 of data collection was completed in 2012. Round 2 of sampling began in 2015 with completion scheduled for 2017. The Round 2 data will be assessed for the next report.

The highest average (in oocysts/L) in any 12 consecutive months is compared to SDWA Bin classifications 1 through 4. Any water systems with an average *Cryptosporidium* concentration between 0.075 and less than 1.0 oocysts/L would be placed in Bin 2. Most Ohio public water systems using surface water are already meeting the treatment levels required for this bin. Concentrations equal or greater than 1.0 oocysts/L place the system in Bin 3 or 4 and require additional treatment beyond conventional or source water controls in the watershed, resulting in significant expenditures for the community. Ohio EPA's proposed water quality criteria and watch list condition for *Cryptosporidium* correlate to these trigger concentrations for the Bins.

A review of available data indicates that no water systems have exceeded the 1.0 oocysts/L 12-month average. Ten water systems had average concentrations between 0.075 oocysts/L and 1.0 oocysts/L and met the threshold for the watch list. Watch list water systems are: Akron, Fremont, Berea, Delaware, Westerville, Newark, Greenville, Cambridge, Napoleon and Sebring.

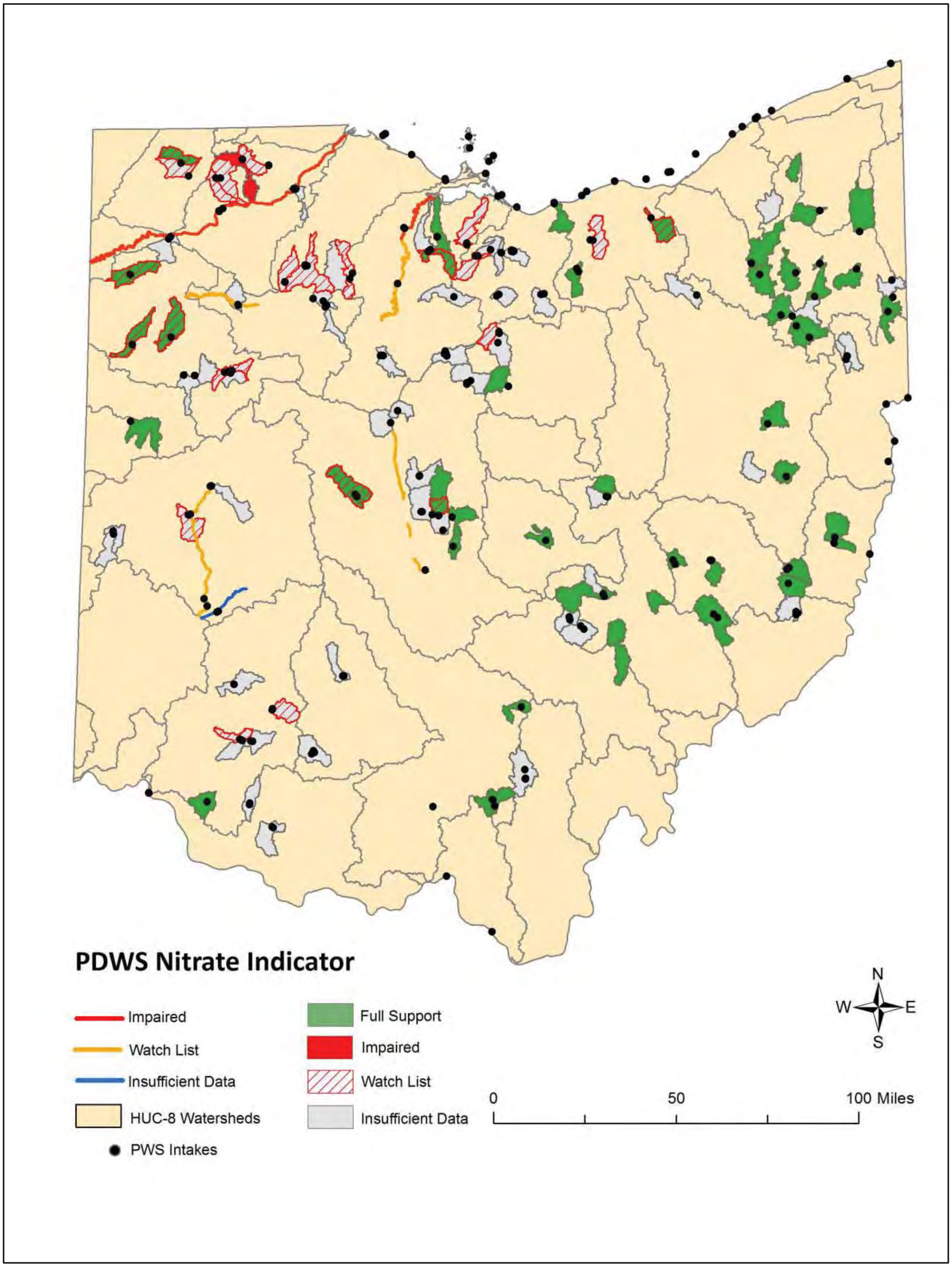

Figure H-2. AUs with nitrate indicator results.

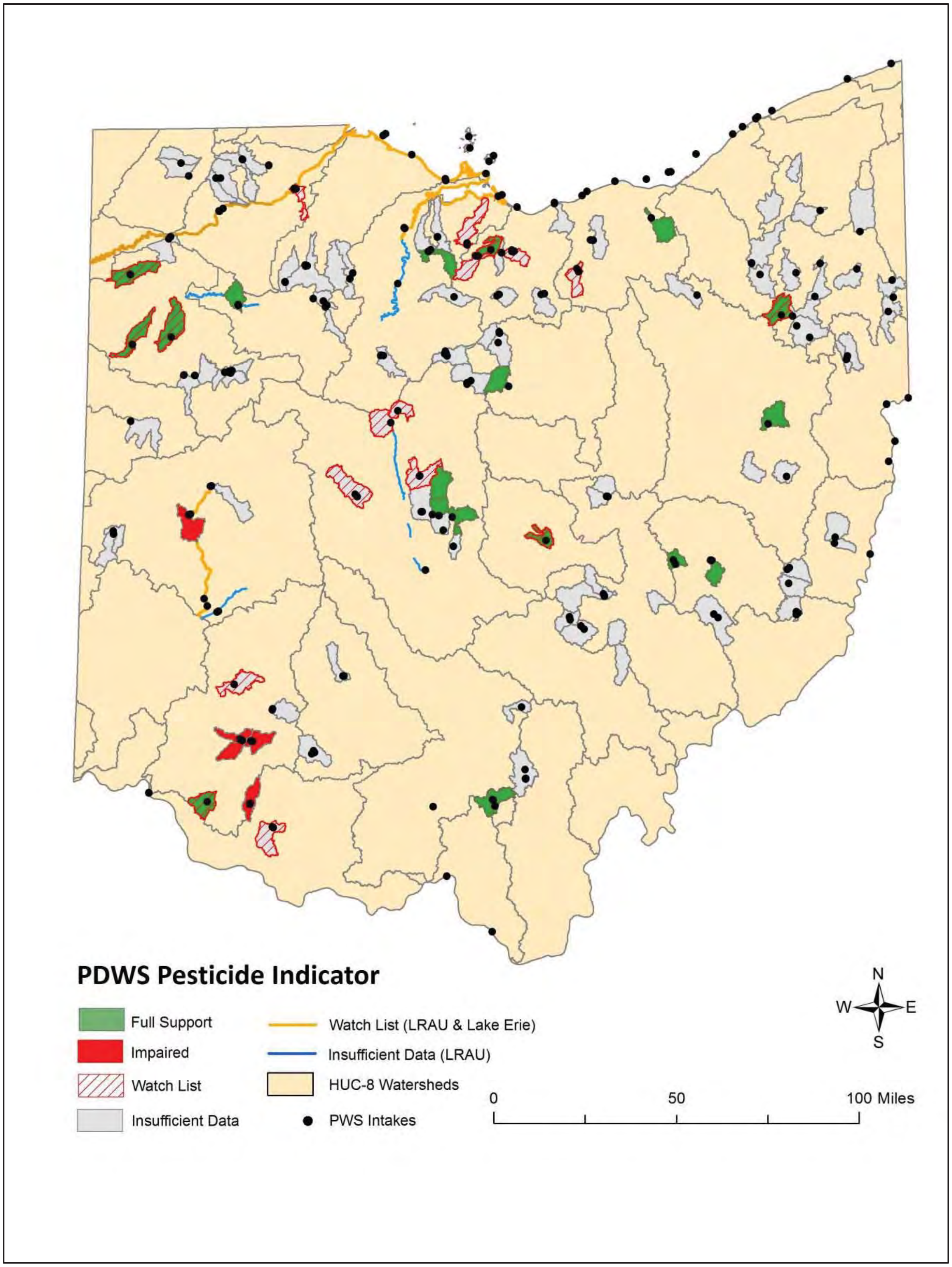

Figure H-3. AUs with pesticide indicator results.

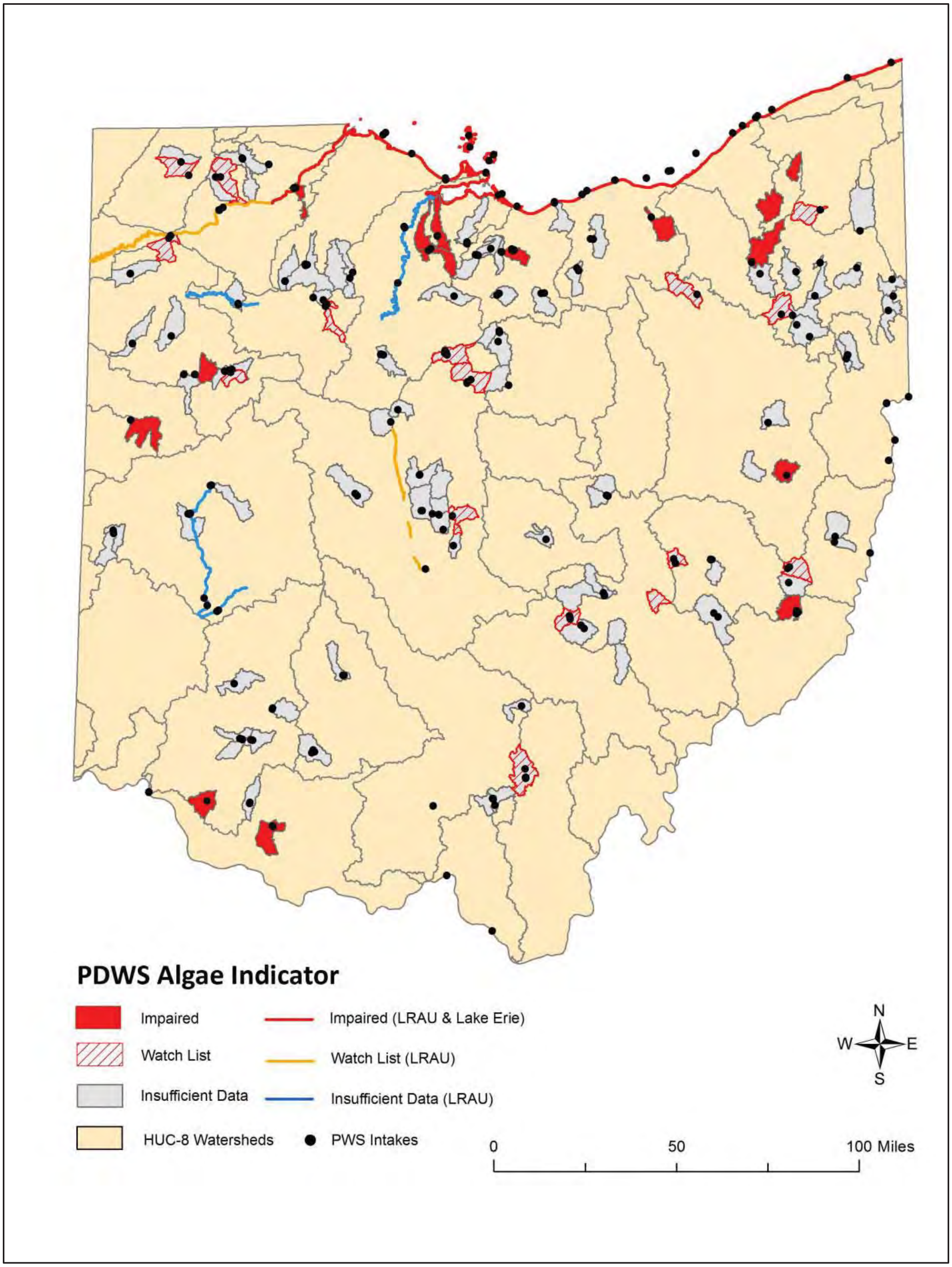

Figure H-4. AUs with algal toxin indicator results.

Table H-2. Waters designated as impaired for (not supporting) the PDWS beneficial use.

Assessment Unit	Cause of Impairment	Summary of Key Water Quality Data
04100005 90 01 Maumee River Mainstem (IN border to Tiffin River)	*Nitrate* One public water system had at least one excursion above the nitrate WQC and finished nitrate levels above the WQC. Original impairment listed in 2008.	The City of Defiance exceeded the nitrate WQC in finished water during three events (12/24/02-1/28/03; 6/17/03-6/19/03; and 5/15/06-5/16/06). None of the excursions occurred during the reporting period, but the impairment will remain until raw water is collected that supports delisting the assessment unit. A watch list level exceedance occurred on 1/14/13 (8.73 mg/L) and there were seven samples collected by the public water system at their intake that exceeded the WQC (>10 mg/L), indicating more data is needed to delist.
04100007 04 03 Honey Run	*Algae* One public water system had intake microcystins concentrations above the threshold in August, October and November 2015.	The City of Lima's Williams Reservoir and Bresler Reservoir had a total of seven raw water microcystins sample results greater than the threshold in the Fall of 2015. Included were 11/2/15 results of 25 ug/L (Williams) and 39 ug/L (Bresler).
04100007 03 02 Lower Bad Creek	*Nitrate* One public water system had two excursions above the Nitrate 10.0 mg/L WQC.	Nitrate Samples collected from source water for Delta Public water system exceeded WQC in 2015. Included were 17.6 mg/L on 6/11/15 and 13.4 mg/L on 7/14/15.
04100009 06 03 Haskins Ditch – Maumee River	*Algae* One public water system had numerous microcystins concentrations above the threshold.	During 2013-2014, the microcystins threshold was exceeded at the Bowling Green public water system reservoir raw water 19 times. For 2015, the average concentration for microcystins exceeded 7.0 ug/L.
04100009 90 01 Maumee River Mainstem (Tiffin River to Beaver Creek)	*Nitrate* One public water system had several excursions above the nitrate WQC during the 5-year period. The public water system had finished nitrate levels above the WQC and received SDWA violations.	Finished water nitrate excursions reported for Campbell's Soup on 12/27/12 (11.3 mg/L), 12/31/12 (12.5 mg/L) and 6/18/14 (10.6 mg/L). In June 2015, finished water sample results exceeded 8.0 mg/L at Napoleon and Campbell's Soup.

Assessment Unit	Cause of Impairment	Summary of Key Water Quality Data
04100009 90 02 Maumee River Mainstem (Beaver Creek to Maumee Bay)	*Nitrate* One public water system had at least one excursion above the nitrate WQC during the 5-year period. *Algae* One public water system had at least two raw water samples above the threshold for microcystins.	Numerous Maumee River samples from 2012 to 2015 exceeded the Nitrate WQC. In addition, raw water from Bowling Green exceeded the nitrate WQC during three events in 2011 and 2012 Bowling Green's raw water intake on the Maumee River exceeded the microcystins threshold four times in limited sampling conducted in 2014 and 2015.
041000110 02 04 Raccoon Creek 04100011 12 02 Beaver Creek 04100011 12 03 Green Creek	*Algae* One public water system had numerous microcystins concentrations above the threshold.	For the City of Clyde public water system, Raccoon Creek Reservoir and Beaver Creek Reservoir raw water sample results for microcystins routinely exceeded the threshold in 2014 and 2015. Included was a maximum of 300 ug/L in July 2015 on Beaver Reservoir.
04100011 90 02 Sandusky River Mainstem (Wolf Creek to Sandusky Bay)	*Nitrate* One public water system had an excursion above the nitrate WQC during the 5-year period in both raw and finished water. This public water system also received SDWA violations.	The City of Fremont exceeded the nitrate WQC in May 2010 (13 mg/L). In addition, Sandusky River samples exceeded the nitrate WQ criteria numerous times from 2010-2015.
04100012 06 03 Norwalk Creek	*Algae* One public water system had at least two raw water samples above the threshold for microcystins.	Norwalk public water system reservoir sampling had 22.7 ug/L microcystins on Memorial Reservoir in August 2014 and results greater than 5.0 ug/L in June and July 2015.

Assessment Unit	Cause of Impairment	Summary of Key Water Quality Data
04110002 01 01 East Branch Reservoir-East Branch Cuyahoga River 04110002 01 04 Ladue Reservoir-Bridge Creek 04110002 02 03 Lake Rockwell-Cuyahoga River	*Algae* One public water system had at least two raw water samples in each assessment unit with microcystins concentrations above the threshold.	Source waters for Akron had microcystins levels above the drinking water threshold on at least two occasions in 2010. Maximum raw water microcystins concentrations were 43.0 ug/L in LaDue reservoir, 3.6 ug/L in East Branch reservoir and 3.2 ug/L in Lake Rockwell.
05030201 01 01 Upper Sunfish Creek	*Algae* One public water system had at least two raw water samples above the threshold for microcystins.	Raw water sampling for Woodsfield public water system from Ruble Lake and Witten Lake exceeded the microcystins threshold in 2015. Included were 1.6 ug/L from Witten Lake on 9/2/15 and 1.4 ug/L from Ruble Lake on 10/13/15.
05040001 01 04 Wolf Creek	*Algae* One public water system had at least two raw water samples exceeding the saxitoxins threshold.	Raw water sample results from Barberton's Wolf Creek Reservoir exceeded the saxitoxins threshold multiple times in 2015. Included were results of 0.25 ug/L on 9/3/15, 0.81 ug/L on 8/22/15 and 0.23 ug/L on 7/23/15.
05040001 15 03 Upper Little Stillwater Creek	*Algae* One public water system had at least two raw water samples above the threshold for microcystins.	Cadiz raw water sampling from Tappan Lake routinely exceeded the microcystins threshold in 2015. There were 48 results greater than 1.0 ug/L threshold with an average result of 2.9 ug/L. In addition, seven microcystins threshold exceedances occurred in 2014.
05080001 07 05 Garbry Creek-Great Miami River	*Pesticides* One public water system had the pesticide atrazine in source water where the annual average exceeded the WQC.	The City of Piqua uses several surface water sources and participates in Syngenta Crop Protection's AMP[1]. Swift Run Lake (impounded section of Swift Run) is one of the three drinking water sources and the atrazine annual average[2] was 3.62 µg/L in 2008. In 2011, atrazine results remained at levels of concern with several lake samples exceeding 12.0 ug/L (4xWQ criteria). This included 38.5 ug/L in June 2011.
05090201 08 02 Headwaters Straight Creek	*Algae* One public water system had at least two raw water samples exceeding the saxitoxins threshold.	During 2015, raw water sampling on Sycamore Run Reservoir (Waynoka Regional public water system) indicated several exceedances of the threshold for saxitoxins. Included are: 0.29 ug/L (12/7/15), 0.68 ug/L (10/29/15), 0.49 ug/L (8/17/15) and 0.82 ug/L (6/26/15).

Assessment Unit	Cause of Impairment	Summary of Key Water Quality Data
05090201 10 01 Sterling Run	*Pesticides* One public water system had the pesticide atrazine in source water where the annual average exceeded the WQC.	The Village of Mt. Orab draws surface water from Sterling Run and participates in Syngenta Crop Protection's AMP[1]. The 2011 annual average[2] (6.2 ug/L) exceeded the WQC. In addition, single sample maximum atrazine detections were over four times the WQC in June 2011 (121 ug/L) and April 2012 (18.05 ug/L).
05090202 07 02 Second Creek 05090202 10 05 West Fork East Fork Little Miami River 05090202 13 01 Headwaters Stonelick Creek	*Pesticides* One public water system had the pesticide atrazine in source water where the annual average exceeded the WQC.	The Village of Blanchester draws surface water from Whitacre Run, Stonelick Creek and the West Fork of the East Fork Little Miami River and participates in Syngenta Crop Protection's AMP[1]. The raw and finished water sampling locations for this monitoring program do not differentiate between the three separate source waters. In 2005, the annual average of the AMP samples was 4.63 µg/L and exceeded the WQC for atrazine in finished water. Ohio EPA conducted two sampling runs in 2008 at the three separate sources and measured elevated atrazine levels ranging between 23 µg/L and 70 µg/L. Considering the 2008 atrazine levels, Ohio EPA conservatively applied the impairment listing to all three AUs. In 2012, atrazine concentrations were greater than four times the WQC in samples collected at Stonelick Creek (102.0 ug/L) and the West Fork of the East Fork Little Miami River (89.5 ug/L) and resulting annual averages for atrazine exceeded the WQC in the source water. Finished water result of 21.7 ug/L in May 2014. The impairment listings will remain until adequate source water sampling is conducted to confirm the water source is no longer impaired.
05090202 12 03 Lucy Run-East Fork Little Miami River	*Algae* One public water system had at least 2 raw water samples with microcystins concentrations above the threshold.	Multiple raw water samples collected from Clermont County public water system source water locations on Harsha Lake (East Fork Lake State Park) exceeded the microcystins threshold. Maximum concentration observed was 190 ug/L in June 2014. Saxitoxins also detected in source water but below the threshold.
05120101 02 04 Grand Lake-St Marys	*Algae* One public water system had at least 2 raw water samples with microcystins concentrations above the threshold.	The Grand Lake Saint Marys public water system intake for the City of Celina continues to be heavily impacted by microcystins. For 2015, the mean microcystins concentration was 60 ug/L with a maximum observed value of 185 ug/L on 9/21/15. 50 sample results were greater than 1.0 ug/L. Threshold exceedances have occurred every year since the lake was first sampled in 2009.

Assessment Unit	Cause of Impairment	Summary of Key Water Quality Data
24001 001 Lake Erie Western Basin Shoreline (including Maumee Bay and Sandusky Bay)	*Algae* Six public water systems had at least two raw water samples with microcystins concentrations above the threshold.	Oregon, Toledo, Carroll Township and Ottawa County have all had raw water samples that exceeded the microcystins threshold in 2010, 2011, 2013, 2014 and 2015. Marblehead had raw water samples that exceed the microcystins threshold in 2010 and 2015. Sandusky had raw water samples that exceeded the microcystins threshold in 2014 and 2015.
24001002 Lake Erie Central Basin Shoreline	*Algae* One public water system had at least two raw water samples above the threshold for microcystins.	Huron had raw water microcystins above the threshold on 9/6/13 (4.6 ug/L) and again on 8/17/15 (2.1 ug/L). In addition, Lake County West, Mentor, Painesville and Fairport Harbor all had raw water microcystins threshold exceedances in 2015.
24001003 Lake Erie Islands Shoreline	*Algae* Four public water systems had at least two raw water samples above the threshold for microcystins.	Raw water microcystins sample results exceeded microcystins thresholds as recently as 2015. Put-In-Bay had sample results above the threshold in 2010 and from 2013-2015. Kelleys Island had results above the threshold from 2013-2015. Camp Patmos had results above the threshold in 2010 and from 2013-2015. Lake Erie Utilities had results above the threshold in 2014 and 2015.

[1] The January 2003 Atrazine Interim Reregistration Eligibility Decision and subsequent Memorandum of Agreement between U.S. EPA and the atrazine registrants, including Syngenta Crop Protection, Inc., initiated an atrazine monitoring program at select community water systems.
[2] Annual average calculated as average of the quarterly means for calendar year.

H4. Supplemental Information

Table H-3 provides a summary of PDWS assessment results for the nitrate, pesticide and algae indicators and is organized by assessment unit. A description of the PDWS use zone is also included.

Table H-3. Summary of PDWS assessment results for the nitrate, pesticide and algae indicators.

Assessment Unit ID	Assessment Unit Name	PDWS Zone [Public Water System(s)]	Use Support	Nitrate Indicator	Pesticide Indicator	Algae Indicator
04100005 90 01	Maumee River Mainstem (IN border to Tiffin River)	Maumee River @ RM 65.84 [Defiance]	No	Impaired	Full Support; Watch List	Insufficient Data; Watch List
04100006 03 01	Bates Creek-Tiffin River	Tiffin River @ RM 47.54 [Archbold]	Yes	Full Support; Watch List	Insufficient Data	Insufficient Data
04100006 03 03	Flat Run-Tiffin River	Archbold Upground Reservoirs [Archbold]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data; Watch List
04100007 02 03	Sims Run-Auglaize River	Auglaize River @ RM 64.58 (Agerter Rd) [Lima]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
04100007 03 05	Lost Creek	Ottawa River @ RMs 42.60 (Roush Rd) and 43.45 (upstream of low-head dam at Metzger Rd) [Lima]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data; Watch List
04100007 03 06	Lima Reservoir-Ottawa River	Lima Reservoir [Lima]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data
04100007 04 03	Honey Run	Bresler Reservoir [Lima]	No	Insufficient Data	Insufficient Data	Impaired
04100007 06 04	Dry Fork-Little Auglaize River	Little Auglaize River @ RM 23.40 [Delphos]	Yes	Full Support; Watch List	Full Support; Watch List	Insufficient Data
04100007 08 04	Lower Town Creek	Town Creek @ RM 18.35 [Van Wert]	Yes	Full Support; Watch List	Full Support; Watch List	Insufficient Data
04100007 12 06	Big Run-Flatrock Creek	Flat Rock Creek @ RM 14.13 [Paulding]	Yes	Full Support; Watch List	Full Support; Watch List	Insufficient Data
04100007 12 09	Eagle Creek-Auglaize River	Defiance Upground Reservoir [Defiance]	Unknown	Insufficient Data	Insufficient Data	Watch List
04100008 02 03	Findlay Upground Reservoirs-Blanchard River	Findlay Upground Reservoirs [Findlay]	Unknown	Insufficient Data	Insufficient Data	Watch List
04100008 02 05	City of Findlay Riverside Park-Blanchard River	Blanchard River @ RMs 58.72, 62.43 and 65.20 [Findlay]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
04100008 06 02	Pike Run-Blanchard River	Ottawa Upground Reservoirs [Ottawa]	Unknown	Insufficient Data	Full Support	Insufficient Data

Assessment Unit ID	Assessment Unit Name	PDWS Zone [Public Water System(s)]	Use Support	Nitrate Indicator	Pesticide Indicator	Algae Indicator
04100008 90 01	Blanchard River Mainstem (Dukes Run to mouth)	Blanchard River @ RM 28.50 [Ottawa]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data
04100009 03 02	Lower Bad Creek	Bad Creek @ RM 17.0 [Delta]	No	Impaired	Insufficient Data	Insufficient Data
04100009 04 01	Konzen Ditch	Unnamed trib segments immediately adjacent to Wauseon Reservoir, Big Ditch Intake [Wauseon]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data
04100009 04 02	North Turkeyfoot Creek	Stucky Ditch Intake and Reservoir [Wauseon]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data; Watch List
04100009 06 03	Haskins Road Ditch – Maumee River	Bowling Green Upground Reservoir [Bowling Green]	No	Insufficient Data	Insufficient Data Watch List	Impaired
04100009 07 02	Fewless Creek-Swan Creek	Swan Creek @ RM 30.84 [Swanton]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data
04100009 90 01	Maumee River Mainstem (Tiffin River to Beaver Creek)	Maumee River @ RMs 35.91 [McClure], 45.88 and 47.10 [Campbell Soup], 47.13 [Napoleon and Wauseon]	No	Impaired	Full Support; Watch List	Watch List
04100009 90 02	Maumee River Mainstem (Beaver Creek to Maumee Bay)	Maumee River @ RMs 23.16 [Bowling Green]	No	Impaired	Insufficient Data; Watch List	Impaired
04100010 01 01	Rader Creek	Rader Creek @ RM 13.57 and upground reservoirs [McComb]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data
04100010 01 03	Rocky Ford	Rocky Ford Creek @ RMs 10.66 and 11.10 and Upground Reservoirs [North Baltimore]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data
04100010 02 02	East Branch Portage River	East Branch Portage River @ RMs 13.84 and 16.15 and Upground Reservoirs [Fostoria]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data
04100010 02 03	Town of Bloomdale - South Branch Portage River	Veterans Memorial Reservoir [Fostoria]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data

Assessment Unit ID	Assessment Unit Name	PDWS Zone [Public Water System(s)]	Use Support	Nitrate Indicator	Pesticide Indicator	Algae Indicator
04100011 01 03	Mills Creek	Snyders Ditch @ RMs 5.0 and 5.5 and Upground Reservoirs [Bellevue]	Unknown	Insufficient Data; Watch List	Insufficient Data; Watch List	Insufficient Data
04100011 02 04	Raccoon Creek	Raccoon Creek Upground Reservoir [Clyde]	No	Full Support	Insufficient Data	Impaired
04100011 04 03	Headwaters Middle Sandusky River	Sandusky River @ RM 115.4 and Upground Reservoirs [Bucyrus]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data Watch List
04100011 07 02	Town of Upper Sandusky-Sandusky River	Sandusky River @ RMs 82.9 and 83.15 and Upground Reservoirs [Upper Sandusky]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
04100011 08 05	Middle Honey Creek	Honey Creek @ RM 28.35 and Upground Reservoirs [Attica]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
04100011 12 02	Beaver Creek	Beaver Creek @ RM 2.88 r [Clyde]	No	Full Support; Watch List	Full Support	Impaired
04100011 12 03	Green Creek	Beaver Creek Upground Reservoir [Clyde]	No	Insufficient Data	Insufficient Data	Impaired
04100011 90 01	Sandusky River Mainstem (Tymochtee Creek to Wolf Creek)	Sandusky River @ RM 41.08 [Tiffin-Ohio American Water]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data
04100011 90 02	Sandusky River Mainstem (Wolf Creek to Sandusky Bay)	Sandusky River @ RM 18.02 [Fremont]	No	Impaired	Insufficient Data; Watch List	Insufficient Data
04100012 01 04	New London Upground Reservoir-Vermilion River	Vermilion River @ RM 52.24 and Upground Reservoirs [New London]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
04100012 02 04	Mouth Vermilion River	Vermilion River @ RM 0.2 [Vermilion]	Yes	Full Support	Insufficient Data	Insufficient Data
04100012 04 03	Walnut Creek-West Branch Huron River	West Branch Huron River @ RM 33.8 and Upground Reservoirs [Willard]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
04100012 05 03	Frink Run	Frink Run @ RM 4.83 and Upground Reservoir #5 [Bellevue]	Unknown	Insufficient Data; Watch List	Insufficient Data; Watch List	Insufficient Data
04100012 05 06	Mouth West Branch Huron River	W. Branch Huron River @ RM 8.52 and Upground Reservoirs [Monroeville]	Unknown	Insufficient Data	Full Support; Watch List	Insufficient Data

Assessment Unit ID	Assessment Unit Name	PDWS Zone [Public Water System(s)]	Use Support	Nitrate Indicator	Pesticide Indicator	Algae Indicator
04100012 06 03	Norwalk Creek	Norwalk Creek @ RMs 0.11 and 4.02 [Norwalk]	No	Insufficient Data	Insufficient Data; Watch List	Impaired
04100012 06 04	Mouth East Branch Huron River	East Branch Huron River @ RM 6.16 [Norwalk]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
04110001 02 02	Baldwin Creek-East Branch Rocky River	E. Branch Rocky River @ RM 5.06, Baldwin Creek @ RM 0.48, upstream boundaries of Rocky River reservation (RM 15.15) to West Branch [Berea]	Yes	Full Support; Watch List	Insufficient Data	Insufficient Data Watch List
04110001 05 01	Charlemont Creek	Charlemont Creek @ RM 2.97 and Upground Reservoir [Wellington]	Yes	Full Support	Insufficient Data; Watch List	Insufficient Data
04110001 05 06	Lower West Branch Black River	West Branch Black River @ RM 14.42 [Oberlin]	Unknown	Insufficient Data Watch List	Insufficient Data	Insufficient Data
04110002 01 01	East Branch Reservoir – East Branch Cuyahoga River	East Branch Reservoir [Akron]	No	Full Support	Insufficient Data	Impaired
04110002 01 04	LaDue Reservoir- Bridge Creek	LaDue Reservoir [Akron]	No	Insufficient Data	Insufficient Data	Impaired
04110002 02 02	Feeder Canal-Breakneck Creek	Lake Hodgson (Breakneck Creek) [Ravenna]	Yes	Full Support	Insufficient Data	Insufficient Data
04110002 02 03	Lake Rockwell-Cuyahoga River	Lake Rockwell (Cuyahoga River RM 62.0 to 57.97) [Akron]	No	Full Support	Insufficient Data	Impaired
04110004 01 02	Headwaters Grand River	Grand River @ RM 89.12 [West Farmington]	Yes	Full Support	Insufficient Data	Insufficient Data Watch List
05030101 04 03	Stone Mill Run-Middle Fork Little Beaver Creek	Salem Reservoir [Salem]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05030101 05 01	Cold Run	Cold Run @ RM 4.96, Salem Reservoir, Unnamed Tributary (Cold Run RM 4.97) @ RM 1.42 [Salem]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05030103 01 03	Fish Creek-Mahoning River	Mahoning River @ RMs 83.55 [Alliance] and 91.50 [Sebring]	Yes	Full Support	Insufficient Data	Insufficient Data
05030103 02 01	Deer Creek	Deer Creek @ RM 0.54 (Walborn Reservoir) [Alliance]	No	Full Support	Full Support; Watch List	Watch List

Assessment Unit ID	Assessment Unit Name	PDWS Zone [Public Water System(s)]	Use Support	Nitrate Indicator	Pesticide Indicator	Algae Indicator
05030103 02 04	Island Creek-Mahoning River	Berlin Lake [MVSD]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05030103 03 04	Kirwin Reservoir-West Branch Mahoning River	West Branch @ RM 13.25 (W. Branch/Michael J. Kirwan Res) [ODNR-West Branch S.P.]	Yes	Full Support	Insufficient Data	Insufficient Data
05030103 03 06	Charley Run Creek-Mahoning River	Mahoning River @ RMs 56.47 [Newton Falls]	Yes	Full Support	Insufficient Data	Insufficient Data
05030103 05 02	Middle Mosquito Creek	Mosquito Creek @ RM 12.49 (Reservoir) [Warren]	Yes	Full Support	Insufficient Data	Insufficient Data
05030103 07 03	Lower Meander Creek	Meander Creek @ RM 2.96 (Meander Cr Reservoir) [Mahoning Valley S.D.]	Yes	Full Support	Insufficient Data	Insufficient Data
05030103 08 05	Headwaters Yellow Creek	Yellow Creek @ RM 8.40 (Lake Evans) [Struthers- Aqua Ohio]	Yes	Full Support	Insufficient Data	Insufficient Data
05030103 08 06	Burgess Run-Yellow Creek	Yellow Creek @ RM 2.0 (Lake Hamilton) [Campbell]	Yes	Full Support	Insufficient Data	Insufficient Data
05030103 08 07	Dry Run-Mahoning River	Dry Run @ RM 2.86 (Lake McKelvey) [Campbell]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05030106 03 03	Cox Run-Wheeling Creek	Jug Run @ RM 3.18 (Provident Reservoir) [St. Clairesville]	Yes	Full Support	Insufficient Data	Insufficient Data
05030106 07 03	Little McMahon Creek	Little McMahon Creek @ RM 6.6 (St. Clairesville Reservoir) [St. Clairesville]	Yes	Full Support	Insufficient Data	Insufficient Data
05030106 09 01	North Fork Captina Creek	Unnamed trib (North Fork RM 10.0) @ RM 0.55 (Res #1 and #3) [Barnesville]	Yes	Full Support	Insufficient Data	Insufficient Data Watch List
05030106 09 02	South Fork Captina Creek	Slope Creek @ RM 1.85 Slope Creek Res) [Barnesville]	Yes	Full Support	Insufficient Data	Insufficient Data
05030201 01 01	Upper Sunfish Creek	Sunfish Creek @ RM 25.50, Unnamed trib (Sunfish Creek RM 24.55) @ RM 0.15 and 0.80 [Woodsfield]	No	Insufficient Data	Insufficient Data	Impaired
05030201 09 01	Headwaters West Fork Duck Creek	Wolf Run @ RM 0.7 (Wolf Run Lake), Dog Run @ RM 1.35 (Caldwell Lake) [Caldwell]	Yes	Full Support	Insufficient Data	Insufficient Data
05030204 01 01	Center Branch	Center Branch Rush Creek @ RM 5.45, Unnamed Tributary (Somerset Creek RM 1.84) @ RM 0.89 [Somerset]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data Watch List

Assessment Unit ID	Assessment Unit Name	PDWS Zone [Public Water System(s)]	Use Support	Nitrate Indicator	Pesticide Indicator	Algae Indicator
05030204 01 02	Headwaters Rush Creek	Yeager Creek (Rush Creek RM 28.46) @ RM 1.0; New Lexington Reservoir [New Lexington]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05030204 07 01	East Branch Sunday Creek	East Branch Sunday Creek @ RM 0.23 [Burr Oak Regional]	Yes	Full Support	Insufficient Data	Insufficient Data
05040001 01 04	Wolf Creek	Wolf Creek @ RM 5.12 (Reservoir) [Barberton]	No	Insufficient Data	Insufficient Data	Impaired
05040001 08 02	Pleasant Valley Run-Indian Fork	Indian Fork @ RM 3.0 and 3.7 (Atwood Lake) [Atwood Park and Resort]	Yes	Full Support	Full Support	Insufficient Data
05040001 15 03	Upper Little Stillwater Creek	Tappan Lake [Cadiz]	No	Full Support	Insufficient Data	Impaired
05040001 16 04	Town of Uhrichsville-Stillwater Creek	Stillwater Creek @ RM 7.05 [Twin City W&S]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05040002 01 01	Marsh Run	Marsh Run Creek @ RM 0.05 [Shelby]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data
05040002 01 02	Headwaters Black Fork Mohican River	Black Fork River @ RMs 50.82, 53.88 [Shelby]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05040002 03 01	Headwaters Clear Fork Mohican River	Clear Fork River @ RM 30.6 (Clear Fork Reservoir) [Mansfield]	Yes	Full Support	Full Support	Insufficient Data
05040003 09 01	Mohawk Creek	No identifiable associated stream (dug reservoirs) [Echoing Hills]	Yes	Full Support	Insufficient Data	Insufficient Data
05040004 01 02	Winding Fork	Shalimar Lake [Echoing Hills]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05040004 04 05	Kent Run	Kent Run @ RM 1.3 [Maysville]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05040004 04 07	Painter Creek-Jonathon Creek	Frazier's Run (Fraziers Quarry) [Maysville]	Yes	Full Support	Insufficient Data	Insufficient Data
05040004 05 01	Black Fork	Dry Run @ RM 2.23 (Resv 1 and 2), Black Fork @ RM 4.69 (Resv. 3,4,5) [Crooksville]	Yes	Full Support	Insufficient Data	Insufficient Data
05040004 06 05	Manns Fork Salt Creek	Manns Fork Salt Creek @ RM 6.77 (Cutler Lake) [ODNR-Blue Rock S.P.]	Yes	Full Support	Insufficient Data	Insufficient Data Watch List
05040005 02 07	Trail Run-Wills Creek	Wills Creek (Cambridge Reservoir) [Cambridge]	Yes	Full Support	Full Support	Insufficient Data

Assessment Unit ID	Assessment Unit Name	PDWS Zone [Public Water System(s)]	Use Support	Nitrate Indicator	Pesticide Indicator	Algae Indicator
05040005 05 01	North Crooked Creek	North Crooked Creek [New Concord]	Yes	Full Support	Full Support	Watch List
05040006 02 05	Log Pond Run-North Fork Licking River	North Fork Licking River @ RM 3.0 [Newark]	Yes	Full Support	Full Support; Watch List	Insufficient Data
05060001 03 03	City of Marion-Little Scioto River	Little Scioto River @ RM 7.1 [Marion-Ohio American Water]	Unknown	Insufficient Data	Insufficient Data; Watch List	Insufficient Data
05060001 04 06	Glade Run-Scioto River	Scioto River @ RM 180.04 [Marion-Ohio American Water]	Unknown	Insufficient Data	Insufficient Data; Watch List	Insufficient Data
05060001 06 02	Middle Mill Creek	Mill Creek @ RM 19.45 [Marysville]	Unknown	Full Support; Watch List	Insufficient Data; Watch List	Insufficient Data
05060001 08 01	Headwaters Olentangy River	Rocky Fork (Olentangy River RM 84.84) @ RM 0.6 [Galion]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data Watch List
05060001 10 07	Delaware Run-Olentangy River	Olentangy River @ RMs 31.23 and 31.02 [Delaware]	Unknown	Insufficient Data	Insufficient Data; Watch List	Insufficient Data
05060001 11 01	Deep Run-Olentangy River	Olentangy River @ RM 18.19 [Del-Co]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05060001 13 08	Hoover Reservoir-Big Walnut Creek	Hoover Reservoir, Duncan Run @ RM 0.68 [Columbus]	Yes	Full Support	Full Support	Insufficient Data Watch List
05060001 14 03	Big Run-Alum Creek	Alum Creek Reservoir [Del-Co]	Yes	Full Support	Full Support	Insufficient Data
05060001 14 04	Alum Creek Dam-Alum Creek	Alum Creek Reservoir and Alum Creek @ RM 26.74 [Del-Co]	Yes	Full Support Watch list	Full Support	Insufficient Data
05060001 15 02	City of Gahanna-Big Walnut Creek	Big Walnut Creek @ RM 32.64 [Columbus]	Yes	Full Support	Insufficient Data	Insufficient Data
05060001 16 01	Westerville Reservoir-Alum Creek	Alum Creek @ RM 21.20 (@ low-head dam) [Westerville]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05060001 90 01	Scioto River Mainstem (L. Scioto R. to Olentangy R.); excluding O'Shaughnessy and Griggs reservoirs	Scioto River at O'Shaughnessy dam (RM 148.8) to Dublin Road WTP dam [Columbus]	Yes	Full Support; Watch List	Insufficient Data	Insufficient Data Watch List

Assessment Unit ID	Assessment Unit Name	PDWS Zone [Public Water System(s)]	Use Support	Nitrate Indicator	Pesticide Indicator	Algae Indicator
05060002 08 02	Buckeye Creek	Buckeye Creek/Hammertown Lake [Jackson]	Yes	Full Support	Full Support	Insufficient Data
05060002 08 03	Horse Creek-Little Salt Creek	Jisco Lake [Jackson]	Yes	Full Support	Full Support	Insufficient Data
05060002 09 02	Queer Creek	Rose Lake [ODNR-Hocking Hills S.P.]	Yes	Full Support	Insufficient Data	Insufficient Data
05060003 01 03	Town of Washington Court House-Paint Creek	Paint Creek @ RM 71.4 [Washington Court House]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05060003 05 02	Clear Creek	Clear Creek (Rocky Fork) @ RM 7.4 [Hillsboro]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05080001 07 02	Mosquito Creek	Tawawa Creek @ RM 0.14 [Sidney]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05080001 07 05	Garbry Creek-Great Miami River	Piqua Hydraulic System (Swift Run Lake) and Ernst Gravel Pit [Piqua]	No	Insufficient Data Watch List	Impaired	Insufficient Data
05080001 11 01	Mud Creek	Mud Creek @ RM 0.88 [Greenville]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05080001 11 02	Bridge Creek-Greenville Creek	Greenville Creek @ RM 22.3 [Greenville]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05080001 90 01	Great Miami River Mainstem (Tawawa Creek to Mad River)	Great Miami River @ RMs 86.6 and 90.3 [Dayton], 118.3 [Piqua] and 130.2 [Sidney]	Unknown	Insufficient Data; Watch List	Insufficient Data; Watch List	Insufficient Data
05080001 90 02	Mad River Mainstem (Donnels Creek to mouth)	Mad River @ RMs 5.2 and 5.6 [Dayton]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data
05090101 04 01	Headwaters Little Raccoon Creek	Little Raccoon Creek @ RM 30, Lake Rupert, Alma Lake [Wellston]	Unknown	Insufficient Data	Insufficient Data	Insufficient Data Watch List
05090201 08 02	Headwaters Straight Creek	Sycamore Run @ RM 0.97 (Reservoir) and Straight Creek (Lake Waynoka) [Waynoka Regional]	No	Insufficient Data	Insufficient Data; Watch List	Impaired
05090201 10 01	Sterling Run	Sterling Run @ RM 6.47 [Mt. Orab]	No	Insufficient Data	Impaired	Insufficient Data
05090202 04 06	Lower Caesar Creek	Caesar Creek Lake [Wilmington]	Unknown	Insufficient Data	Insufficient Data; Watch List	Insufficient Data

Assessment Unit ID	Assessment Unit Name	PDWS Zone [Public Water System(s)]	Use Support	Nitrate Indicator	Pesticide Indicator	Algae Indicator
05090202 06 04	Headwaters Cowan Creek	Cowan Creek @ RM 11.7 [Wilmington]	Unknown	Insufficient Data; Watch List	Insufficient Data	Insufficient Data
05090202 07 02	Second Creek	Whitacre Run @ RM 1.4 [Blanchester]	No	Insufficient Data Watch List	Impaired	Insufficient Data
05090202 10 05	West Fork East Fork Little Miami River	West Branch of the East Fork LMR @ RM 4.6 and Westboro Reservoir [Blanchester]	No	Insufficient Data	Impaired	Insufficient Data
05090202 12 03	Lucy Run-East Fork Little Miami River	Harsha Lake - Impounded E. Fork LMR [Clermont County]	No	Full Support	Full Support; Watch List	Impaired
05090202 13 01	Headwaters Stonelick Creek	Stonelick Creek @ RM 23.4 [Blanchester]	No	Insufficient Data	Impaired	Insufficient Data
05120101 02 04	Grand Lake-St Marys	Grand Lake St. Marys [Celina]	No	Full Support	Insufficient Data	Impaired
24001 001	Lake Erie Western Basin Shoreline (including Maumee Bay and Sandusky Bay)	[Sandusky, Marblehead, Ottawa County Regional, Carrol Water & Sewer, Oregon, Toledo]	No	Full Support	Insufficient Data; Watch List	Impaired
24001 002	Lake Erie Central Basin Shoreline	[Conneaut, Ashtabula-Ohio American Water, Lake County East, Lake County West, Painesville, Fairport Harbor, Mentor-Aqua Ohio, Cleveland, Avon Lake, Elyria, Lorain, Vermilion, Huron]	No	Full Support	Insufficient Data	Impaired
24001 003	Lake Erie Islands Shoreline	[Kelleys Island, Camp Patmos, Lake Erie Utility Co., Put-in-Bay]	No	Full Support	Insufficient Data	Impaired

Notes: "Use Support" reports on the PDWS beneficial use status for each assessment unit and is described as follows:
"Unknown" = insufficient data to complete the assessment for the PDWS zones within the assessment unit
"No" = Impairment of at least one PDWS zone within the assessment unit
"Yes" = Full support of the PDWS use within the assessment unit

Following the approval of the 2014 IR, Ohio EPA discovered that some PDWS waters were incorrectly categorized on the 2014 303(d) list (as found in Section L4 of that report), possibly in the original sorting of the PDWS WAUs. The LRAUs and LEAUs were correctly reported. The following table shows the WAUs that were incorrectly identified as "impaired" in Section L4 - 303(d) List of Prioritized Impaired Waters – of the 2014 IR and what the correct category for those waters should have been.

Assessment Unit ID	Assessment Unit Name	Reported Category[2]	Correct Category
04100007 03 05	Lost Creek	5	3i
05090202 10 06	Glady Creek-East Fork Little Miami River	5	0
05090202 11 02	Fivemile Creek-East Fork Little Miami River	5	0
05090202 09 02	O'Bannon Creek	5	0
04110001 07 02	Mouth Beaver Creek	5	0
04110002 01 02	West Branch Cuyahoga River	5	0
04110002 02 01	Potter Creek-Breakneck Creek	5	0
05120101 01 01	Headwaters Wabash River	5	0
05080001 06 03	Turtle Creek	5	0
05090202 06 02	Headwaters Todd Fork	5	0
05090201 08 03	Evans Run-Straight Creek	4A	0

Below is the complete list of all AUs that should have been categorized as "impaired" in Section L4 of the 2014 IR and how they were actually reported. These waters were correctly listed as "impaired" in Table H-2 of the 2014 IR.

Assessment Unit ID	Assessment Unit Name	Reported Category	Correct Category
04100005 90 01	Maumee River Mainstem (IN border to Tiffin River)	5h	5h
04100007 03 06	Lima Reservoir-Ottawa River	0	5
04100009 90 01	Maumee River Mainstem (Tiffin River to Beaver Creek)	5h	5h
04100009 90 02	Maumee River Mainstem (Beaver Creek to Maumee Bay)	5h	5h
04100011 90 02	Sandusky River Mainstem (Wolf Creek to Sandusky Bay)	5	5
04110002 01 01	East Branch Reservoir-East Branch Cuyahoga River	0	5
04110002 01 04	Ladue Reservoir-Bridge Creek	0	5
04110002 02 03	Lake Rockwell-Cuyahoga River	0	5
05080001 07 05	Garbry Creek-Great Miami River	0	5
05090201 10 01	Sterling Run	0	4A
05090202 07 02	Second Creek	0	5
05090202 10 05	West Fork East Fork Little Miami River	0	5
05090202 12 03	Lucy Run-East Fork Little Miami River	0	5
05090202 13 01	Headwaters Stonelick Creek	0	5
05120101 02 04	Grand Lake-St Marys	0	5
24001 001	Lake Erie Western Basin Shoreline (including Maumee Bay and Sandusky Bay)	5	5

[2] Category descriptions are as follows: 0 = no waters currently utilized for water supply; 1 = use attaining; 3i = use attainment unknown because of insufficient data; 4A = impaired, but a TMDL has been completed; 5 = impaired and a TMDL is needed; 5h = impaired based on historical data and a TMDL is needed.

Considerations for Future Lists

As new ideas are introduced and in the general course of progress, it is natural for evaluation and reporting of water quality conditions to evolve. Since the introduction of the Integrated Report format in 2002, methods for evaluating the recreation use, the human health use (via fish contaminants) and public drinking water supply use have been systematically added to the traditional aquatic life use reporting.

This section identifies future reporting possibilities and the status of each. The potential future changes include reporting on more types of waters (wetlands, inland lakes) or reporting on specific pollutants of interest (mercury).

I1. Wetlands

Tables and figures cited in this section are contained in the I1 Wetlands Supplement located at the end of this section.

Ohio EPA's Integrated Report (IR) provides information on the overall condition of Ohio's water resources and also identifies those waters that are not currently meeting water quality goals (Ohio EPA, 2012). It fulfills the requirements under the Clean Water Act (CWA) to report biennially on the current condition of Ohio's regulated waters [305(b) report] and to provide a list of impaired waters [303(d) list]. Despite wetlands being regulated as "waters of the state," until now, Ohio has not developed a strategy for including information on the condition of the state's wetland resources as part of the integrated reporting process. Given the sheer number of National Wetland Inventory (NWI) mapped wetlands in Ohio (n = 134,736), it is obviously not feasible to identify individual wetlands that are considered to be impaired as part of the 303(d) list. The 2012 version of Ohio's IR discussed a plan for incorporating wetland information into future reports, as general 305(b) information by using five primary items:

1) identify historic wetland resources using NRCS digital soil survey data;
2) identify existing wetland resources using NWI data;
3) perform a preliminary off-site wetland condition assessment using a level 1 GIS tool;
4) include information on past wetland field assessments within each HUC12 watershed; and
5) describe and summarize watershed specific field assessment work.

The 2014 report was our first attempt at implementing this plan. In 2013, Ohio EPA's Wetland Ecology Group (WEG) completed a study focusing on the inclusion of wetland information in the Total Maximum Daily Load (TMDL) process on the Middle Scioto watershed (Gara, Harcarik and Schumacher, 2013). This study provides the framework for incorporating wetland information into this reporting process. The focus of the study was twofold: 1) conduct a probabilistic survey of wetland condition for a current TMDL project in central Ohio using Level 2 [Ohio Rapid Assessment Method for Wetlands (ORAM)] and Level 3 [Vegetation Index of Biotic Integrity (VIBI)] assessment tools and 2) develop a Geographic Information System (GIS)-based Level 1 assessment tool to estimate wetland condition within this survey area. The results of the Level 1 assessment were then compared to those obtained using the more detailed Level 2 and Level 3 field assessments. The Level 1 tool that was developed for the Middle Scioto TMDL study differs slightly from the proposed tool included in the 2012 IR. This updated assessment methodology is based on close statistical relationships between the individual metrics and detailed field assessments previously conducted by the WEG. For this reason, the updated Level 1 tool was used when characterizing wetland condition within each of Ohio's HUC12 watersheds. This information is described in much more detail later on in the Wetlands section of this report.

I1.1 Middle Scioto TMDL

Overview of Middle Scioto TMDL Survey Area

The TMDL survey area chosen for this project was the Middle Scioto River, which is composed of two separate HUC10 watersheds: Indian Run-Scioto River [0506000112] and Scioto Big Run-Scioto River [0506000123]. These watersheds are located in central Ohio, running from southern Delaware and Union counties, along the west side of the Columbus metropolitan area and extending south to Circleville in Pickaway County (Figure 1). A vast majority of the TMDL area is heavily modified from development activities. The Middle Scioto is located entirely within the Eastern Corn Belt Plains ecoregion (Omernik, 1987) and has an area of approximately 307 square miles. It is predominantly composed of urban (48 percent) and agricultural land uses (43 percent) based on the 2006 National Land Cover Dataset (NLCD) (Fry et al., 2011). Only 8 percent of the area is composed of land uses not predominantly influenced by human activity (forest, wetland, open water, etc.) (Figure 2).

Wetland Field Assessment Methods and Results

Wetland Sample Selection

Wetlands to be included in Middle Scioto TMDL study were selected from the database of NWI (U.S. Fish and Wildlife Service, 2006-2007) wetland polygons contained within the two HUC10 watersheds which define the study area: Indian Run-Scioto River [0506000112] and Scioto Big Run-Scioto River [0506000123]. Mapped wetland polygons less than 0.1 acre in size were precluded from the initial evaluation. This reduced the total number of potential sites from 671 to 617 separate emergent (N=401), forested (N=191) and scrub-shrub (N=25) wetlands (Figure 3). A Generalized Random Tessellation Stratified (GRTS) survey design was run to select a subset of sites for inclusion in the study (Stevens and Olsen, 2004). This procedure selects a proportional number of sites in each of the three wetland types, based on the total number of emergent, forested and scrub-shrub wetlands present in the TMDL area. In order to ensure enough wetlands were included to account for sites that would need to be dropped from the study due to mapping errors, wetland conversion, landowner resistance, etc. a total of 50 base sites and 150 oversample sites were selected using the GRTS survey design. The first 50 wetlands on the list that met all necessary criteria and could be successfully accessed by the WEG were the sites included in the final ecological condition analysis for the Middle Scioto TMDL area (Figure 4).

Ecological Condition Assessments

Each of the 50 wetlands was assessed using ORAM version 5.0 (Mack, 2001). ORAM is a rapid assessment that evaluates the ecological condition of a wetland using field survey data collected via visual observation of various environmental factors. Scores range from 0 to 100, with low scores indicating poor ecological condition and high scores assigned to wetlands in excellent condition. Additionally, in order to verify the results obtained using ORAM, a more detailed biological survey was conducted on a subset of 10 sites using the VIBI (Mack, 2007). The VIBI is a Level 3 analysis that requires a detailed knowledge of the plant community and can take several hours of field work to conduct. A total of 10 metrics are scored depending on the type of plant community present and, as with ORAM, the higher the VIBI score generated, the better the ecological condition of the wetland. High ORAM and VIBI scores are typically indicative of wetlands relatively protected from human disturbance. Figure 4 illustrates the location for all ORAM and VIBI survey sites that were conducted within the Middle Scioto TMDL study area. Initial field work was done during the 2010 growing season (17 ORAMs, 10 VIBIs), with the

remainder completed in the summer of 2012 (33 ORAMs).

Additionally, a new, simplified version of the VIBI has been developed by the WEG. This procedure is referred to as the VIBI – floristic quality (VIBI-FQ) and a separate VIBI-FQ score was calculated using field data collected for the traditional VIBI as part of this study. The VIBI-FQ is considered a Level 3 assessment, as it requires a complete analysis of the species composition of the plant community. However, only two metrics are calculated, making the overall analysis and interpretation of the VIBI-FQ more straightforward than the traditional VIBI. Preliminary comparisons between the VIBI and VIBI-FQ show a strong statistical correlation between the two approaches (Gara, 2013).

Results of all wetland field assessments that were conducted in the Middle Scioto TMDL area during the 2010 and 2012 growing seasons are shown in Table 1. Comparing results of the detailed assessments (VIBI and VIBI-FQ) with ORAM scores on the same wetlands yielded very similar results. Both the VIBI (Figure 6; p=0.016, R^2=53.7 percent) and the VIBI-FQ (Figure 7; p=0.001, R^2=76.6 percent) were strongly correlated to the rapid assessment results captured during the ORAM analysis. Consistency in the answer provided by the rapid Level 2 and detailed Level 3 assessments for these 10 sites validates the accuracy of the probabilistic survey of 50 wetlands using only ORAM.

For all 50 Middle Scioto TMDL area wetlands, the mean ORAM score was 40.6, placing the “average” wetland in the study area in fair condition. The breakdown of the 50 wetlands is as follows: 13 (26 percent) were rated as being in poor condition; 19 (38 percent) were rated as fair condition; 11 (22 percent) were good condition; and 7 (14 percent) were considered to be excellent condition. When compared to the WEG reference dataset of natural wetlands, the Middle Scioto TMDL wetlands appear to be skewed slightly to a lower ecological condition than what would be expected for a random selection of wetlands in Ohio (Figure 5). A Tukey’s test comparing the mean ORAM scores for a set of 298 natural wetlands compared with the VIBI antidegradation category shows the strong relationship between ORAM and VIBI that is consistently obtained in various studies of wetlands in Ohio (e.g., Fennessy et al., 2007; Mack and Micacchion, 2007; Micacchion and Gara, 2008). When adding in the Middle Scioto TMDL study wetlands into the analysis, there is no statistically significant difference between the mean ORAM scores for natural wetlands falling in the category 1 range and the mean ORAM score for wetlands assessed as part of this study. Conversely, the Middle Scioto TMDL mean ORAM score *was* different from natural wetlands scoring as category 2 or category 3 when using VIBI and this difference was statistically significant based on the Tukey test.

Level 1 Assessment

A Level 1 desktop assessment tool was developed to predict ecological condition of mapped NWI wetlands, through the evaluation of a variety of landscape-level GIS data layers. All work related to the development of this Level 1 tool was conducted using ArcGIS 10.0 (Environmental Systems Research Institute, 2011). A total of 23 separate parameters were evaluated for inclusion as individual metrics in the Level 1 assessment tool. Each was compared to two separate buffer areas surrounding vegetation survey area boundaries for all natural wetlands in Ohio EPA’s reference wetland database which had been previously assessed by the WEG using the VIBI. A standard VIBI plot measures 20 meters by 50 meters in size and generally represents an area smaller than the overall footprint of the wetland being monitored (in the rare instances that a wetland is too small to accommodate a standard VIBI plot, the plot configuration can be modified slightly when conducting a VIBI).

A total of 298 wetlands have had a digital representation of the precise boundary of the VIBI survey area

generated as part of the study. The two buffers zones are: 1) from the edge of the vegetation plot boundary to a distance of 100 meters ("inner zone") and 2) from the edge of the inner buffer zone to 350 meters ("outer zone").

Selection of Level 1 Metrics

A total of 23 landscape-level parameters were selected and calculated for two separate buffer zones (0 to 100 meters; 100 meters to 350 meters) surrounding the vegetation plot boundaries for 298 natural wetlands that had been previously assessed by the WEG using VIBI. Each of the 23 parameters was then individually compared to three separate field assessments conducted for the natural wetlands (ORAM, VIBI and VIBI-FQ) using a simple linear regression in Minitab. Most of the parameters tested for the two buffer areas showed at least a slight statistical correlation to one or more of the assessments.

A total of ten parameters were selected for inclusion in the Level 1 tool, with each showing a strong correlation to most, if not all, of the three field assessments and for both the inner and outer buffer zones. Results of each of these comparisons for the selected parameters are summarized on Table 2. Additionally, an attempt was made to choose an equal number of environmental factors illustrating both "historic" and "current" conditions surrounding each wetland. Since most available statewide GIS data layers have been developed in the last few decades, "historic" is a relative term meant to convey information related to the previous levels of disturbance present for as far back in time as the data is available. The reasoning was to try and choose geographic data that may provide clues related to the long-term stability of a wetland and its surrounding habitat, which is expected to be associated with resources in better ecological condition. For data layers that have been generated more than two times, such as the NLCD, which is available for 1992, 2001 and 2006, typically the oldest and most recent versions were included as metrics while the intermediate date was removed from consideration. The parameters selected which represent "historic" include the following.

1) **Landscape Development Intensity (LDI) Index for the 1992 National Land Cover Dataset (NLCD) GIS layer.** LDI is a procedure for calculating a human disturbance gradient score for an area. The NLCD is a land use layer created using Landsat satellite data, in which each 30-meter x 30-meter pixel is assigned to one of several discreet land Anderson Level 2 land use categories (Vogelman, et al., 2001). Land use categories contained within the NLCD are assigned an LDI index score, depending on the amount of energy required to maintain the level of disturbance associated with that particular land use (Brown and Vivas, 2005). LDI scores can range from 1.00 to 9.42, with the lowest scores associated with natural habitats and higher scores indicating increasing levels of disturbance.
2) **"Historic Forest" Canopy Percent.** All green-colored areas were extracted from the USGS 7.5 minute topographic maps ("Digital Raster Graphics," or DRGs) as a separate GIS layer, referred to as " historic forest." The source maps used to create the DRGs have a publication date range of 1942 to 1995 for Ohio, with a vast majority (91percent) having been produced in the 1950's and 1960's. This was the earliest source of forest cover information available as a statewide data layer that could be identified.
3) **"Natural" Land Uses minus "Human Disturbance" Land Uses for 1992 NLCD data.** Each individual land use category was evaluated and assigned to either human disturbance dominated, natural, or unknown. Classes in which it was not possible to ascertain an obvious trend (e.g., water, grassland) as to whether these land uses had occurred naturally or due to some level of human disturbance were placed in the "unknown" category and not included in the analysis. For the remaining land uses, the cells of each type were summed together and human-dominated land

uses were subtracted from natural land uses for each of the two buffer zones.

4) **1990 population density estimate within inner and outer buffer zones (U.S. Census Bureau, 1990).**
5) **Percent "Rare" Habitat Types.** This is a GIS layer that combines rare plant density data from the ODNR Natural Heritage database (Division of Natural Areas and Preserves, 2008) and muck or sandy soils from the NRCS SSURGO soils data (Soil Survey Staff, NRCS, accessed 2009). Summing information from both of these information sources is intended to identify sensitive habitats which have recorded rare species present and/or have a substrate typical of certain rare wetland ecosystems (bogs, fens, Oak Openings sand prairies).

Parameters representing current, or at least the most recent information, include the following.

1) **Landscape Development Intensity (LDI) Index for the 2006 National Land Cover Dataset (NLCD) GIS layer (Fry et al., 2011).**
2) **Percent Impervious Surface.** This is an ancillary data layer created as part of the 2006 NLCD. Each Landsat 30-meter x 30-meter pixel is assigned a score indicating the estimated percent of the area that is composed of impervious surface (Xian et al., 2011).
3) **2001 Percent Forest Canopy.** Ancillary data layer created as part of the NLCD. Each Landsat 30-meter x 30-meter pixel is assigned a score indicating the estimated percent of the area is composed of forest canopy (Huang et al., 2003).
4) **"Natural" Land Uses minus "Human Disturbance" Land Uses for 2006 NLCD data.**
5) **2010 population density estimate within inner and outer buffer zones (U.S. Census Bureau, 2010).**

Although the relationship between any one of these parameters and the field assessments showed a considerable amount of scatter, or "noise," strong statistical correlations were evident with each. These correlations exist for each assessment (ORAM, VIBI and VIBI-FQ) and also for both the inner and outer buffer zones.

A metric score of 0, 3, 7 or 10 was assigned to each parameter, based on the quartile distribution of each for the 298 natural wetlands (Table 3). A Level 1 score was then calculated for both the inner and outer buffer zones by summing the 10 individual metric scores for each. To calculate a final score for each wetland, it was assumed that the zone closest to the wetland assessment area has the greatest influence on the ecological condition of that location. Therefore, to calculate a final score for each wetland assessment area, which incorporated Level 1 information for both buffer zones, twice as much weight was given to the 0 to 100-meter buffer Level 1 score. The final calculation is as follows:

Total Wetland Level 1 Score = (Inner Buffer Level 1 Score*0.67) + (Outer Buffer Level 1 Score*0.33)

Comparison of Level 1 score to field assessment data

A Level 1 score was then calculated for each of the 298 natural wetlands in the database and this score was compared to the field assessment scores for VIBI, VIBI-FQ and ORAM. A positive statistical correlation was clearly evident for each, with ORAM showing the strongest relationship to the Level 1 scores (VIBI: p=0.000, R^2= 31.1; VIBI-FQ: p=0.000, R^2= 33.2; ORAM: p=0.000, R^2= 37.8).

The strong statistical relationship between previously-collected field assessment data and Level 1 information can also be illustrated with boxplots, in which the Level 1 scores for all 298 natural wetlands

is divided into quartiles and compared to VIBI, VIBI-FQ and ORAM scores (Figures 6, 7 and 8, respectively). The mean VIBI score for each Level 1 quartile is different for the lowest three quartiles, based on a Tukey's comparison. There is no statistical difference between the mean VIBI scores for the third and fourth Level 1 quartile, however. This suggests that there may be a threshold level of human disturbance that may need to be crossed before a degradation in wetland ecological condition can be quantified. Once this threshold is reached, VIBI scores decline proportionally to increasing disturbance levels (Figure 6). A similar pattern exists for the VIBI-FQ data, except the mean VIBI-FQ scores are statistically different based on Tukey's comparison for all four Level 1 quartiles (Figure 7). ORAM data also demonstrates this pattern. As with VIBI data, mean ORAM scores are statistically different for each of the first three quartiles, but no difference exists between quartiles three and four (Figure 8).

Middle Scioto HUC12 analysis

The Middle Scioto TMDL area is composed of 11 individual HUC12 watersheds. The breakdown of area-weighted Level 1 scores for these watersheds is as follows: six scored as "limited quality wetland habitat" (category 1, or "poor" condition), four fell in the "restorable wetland habitat" (modified category 2, or " fair" condition) range and one scored as "wetland habitat" (category 2, or "good" condition). None of these 11 HUC12s scored in the "superior wetland habitat" (category 3, or "excellent" condition) range, based on the Level 1 assessment. The same 11 watersheds were summarized using field assessment data for the HUC12 watersheds in which a mean condition score was generated for each watershed having more than one ORAM conducted as part of this study. This eliminated two of the HUC12s, as only a single ORAM score had been completed in each and this simply did not provide enough information to warrant assigning a watershed-level condition score. Of the remaining nine HUC12 watersheds, three had a mean ORAM score placing them in the "limited quality wetland habitat" (category 1, or "poor" condition), four fell in the "restorable wetland habitat" (modified category 2, or "fair" condition) range and two scored as "wetland habitat" (category 2, or "good" condition). As with the Level 1 characterization, none of the HUC12s scored in the "superior wetland habitat" (category 3, or "excellent" condition) range. Comparing these results side by side, along with the breakdown of ORAM scores for the probabilistic assessment of Middle Scioto wetlands, shows a similar pattern, with a majority of the HUCs for both the Level 1 and Level 2 characterizations skewed toward lower ecological condition (Figure 9). The ORAM field assessments had a few sites (7 out of 50, 14 percent) scoring in the highest condition category ("Superior Wetland Habitat" [Category 3]), whereas the Level 1 and Level 2 watershed characterization had none. As all of these Middle Scioto assessments resulted in similar results, it is apparent that landscape-level watershed characterizations may be useful for studies of large geographic areas over time. However, it is also important to note that these coarse, GIS-based assessments do not replace the necessity of field-level assessments when needing to accurately determine the ecological condition of a particular wetland.

I1.2 Status of Ohio's Wetland Resources

Ohio's Historic and Current Wetland Resources

Dahl's 1990 report "Wetland Losses in the United States: 1780's to 1980's" identifies Ohio and California as the two states with the highest percent loss of original wetland habitat (90 percent and 91 percent, respectively) (Dahl, 1990). Current high resolution GIS data now exists that allows us to verify the accuracy of the previous estimate for Ohio. Using NRCS Soil Survey Geographic database (SSURGO) data (NRCS, various dates), all areas of the state consisting of mapped hydric soil can be identified. It is inferred that these areas of predominantly hydric soils developed under standing water conditions and,

therefore, are an accurate estimate of historic wetland extent in the state. Figure 10 shows all areas of SSURGO mapped hydric soils in Ohio. Multiplying the percent hydric component of each mapped soil polygon by its area and summing these values statewide, produces an overall estimate of original wetland area for Ohio of 5,344,742 acres, which is remarkably similar to the 5,000,000-acre estimate from Dahl's 1990 publication. Virtually all wetland habitat occurred within the glaciated area of Ohio. Additionally, a majority of the original wetland acreage was located in an area of northwest Ohio referred to as the "Great Black Swamp." This enormous wetland complex represented approximately 60 percent of Ohio's pre-settlement wetlands (~3,000,000 acres) and has been almost completely converted into productive agricultural land. This conversion occurred within a fairly brief period round the time of the Civil War and was accomplished through an elaborately engineered series of surface ditches.

In 2006, Ohio initiated a project to capture high resolution aerial photography for each county in the state. One of the ancillary projects of this Ohio Statewide Imagery Program (OSIP) was the development of an updated layer of NWI wetlands based on photo interpretation of these detailed remotely-sensed datasets (OSIP, 2006-2007). The updated NWI was completed and made available to the public in 2010 (U.S. Fish and Wildlife, 2010). This data layer was the primary resource used to estimate current wetland extent in Ohio. Many of the polygons included in the NWI dataset are open water farm ponds, which would not meet the necessary criteria to be considered a wetland, based on the Corps' delineation procedures. Therefore, for this analysis, only polygons mapped as aquatic bed, emergent, scrub-shrub or forested wetlands were included. Figure 11 is a map of Ohio illustrating the remaining wetland resources based on the mapped NWI wetlands. A total of 134,736 NWI polygons are included in this GIS layer. Summing the entire area yields an estimate of 507,057 acres of existing wetland habitat. This represents a loss of 90.5 percent of Ohio's original wetlands, which is very similar to the estimate included in Dahl's publication. Given the errors inherent in any GIS layer, these figures should be considered to be rough estimates, but are consistent with previous statewide estimates of historic wetland losses in Ohio.

This analysis also illustrated a stark geographic disparity in the distribution of the remaining wetland resources in Ohio. Approximately 29 percent of the remaining mapped NWI area is located in a small, four county area of northeast Ohio (Ashtabula, Geauga, Portage and Trumbull). Additionally, only 1,323 of the NWI wetlands (~1 percent of total NWI polygons) are 50 acres or larger and 39.8 percent of these large wetlands are relegated to this same four county area. For mapped NWI wetlands considered to be very large (500 acres+), this unequal distribution was even more evident, as approximately 70 percent of these very large wetlands occur in the same small area of northeast Ohio. Given the precarious state of wetlands overall in the state, it is our recommendation that private and public funding programs focused on the preservation of water resources should place much greater emphasis on protecting and expanding these remaining large wetlands located in and around this four county area of Ohio.

Statewide analysis of Wetland Condition

In 2015, Ohio EPA completed a National Wetland Condition Assessment "Intensification" study, which was funded by a U.S. EPA wetland program development grant. This study consisted of detailed field assessments of 50 randomly-selected wetlands located throughout the state (Gara and Schumacher, 2015). Both Ohio and U.S. EPA assessment methodologies were used to characterize the condition of these wetlands.

Table 4 displays data from ORAM, VIBI and VIBI-FQ, which have established anti-degradation category scoring breakpoints, compiled by approximate ecological condition ranges ("poor," "fair," "good" and

"excellent"). Somewhat surprisingly, more than half of all wetlands had ORAM scores that fell in the "good" or "excellent" ranges. Similarly, for both VIBI and VIBI-FQ assessments, exactly 50 percent of the wetlands surveyed with both of these protocols fell within the upper range of ecological condition. The ORAM, VIBI and VIBI-FQ intensification study results were also compared to the same assessments conducted on a dataset of 263 natural reference wetlands, surveyed from 1999 to 2010 by Ohio EPA and broken down by ORAM anti-degradation category. In each of these box and whiskers plots [VIBI (Figure 12), VIBI-FQ (Figure 130 and ORAM (Figure 14)], the mean value generated from the 50 intensification sites corresponded most closely with the mean value for VIBI, VIBI-FQ and ORAM for high category 2 wetlands grouping ("good" quality) from the reference database. For each of these assessments, mean values were compared using a Tukey's HSD (honest significant difference) test. The mean VIBI, VIBI-FQ and ORAM values for the 50 intensification wetlands were significantly different from the "poor," "fair" and "excellent" condition reference wetland groups in all cases. Only the group of "good" condition wetlands showed no significant difference form the intensification study wetlands for the three assessments. Based on the consistency of these results among these different comparisons, performed on a random selection of sites across the state, it appears that Ohio's remaining wetlands are in "good" overall ecological condition. This is higher than expected, given the amount of wetland loss experienced historically. However, it is important to emphasize that the 90 percent of Ohio's wetlands that have been lost are no longer providing any wetland functions, making the remaining resources that much more important, regardless of relative ecological condition.

HUC 12 Watershed Level 1 Assessment

In order to generate a wetland condition score for each HUC12 watershed in the state of Ohio, a Level 1 assessment was run for each mapped wetland, based on the most current GIS layer of wetland resources available: the NWI layer (U.S. Fish and Wildlife Service, 2006-2007). The NWI has been updated for Ohio using recent high resolution digital orthophotography captured as part of the Ohio Statewide Imagery Program (OSIP, 2006-2007). The complete NWI layer for Ohio contains 313,390 polygons, which includes several types of water bodies that are generally not considered to be wetlands (e.g., rivers, streams, lakes, ponds, etc.). For this analysis, only NWI polygons classified as emergent, scrub-shrub or forested wetlands were included, which reduces the total number of polygons for Ohio that needed to be processed to 134,736. Each of these NWI wetlands was then converted to a center point to ensure that an interior part of each wetland, which would be the most likely to be protected from human disturbance, would represent the most central location for the analysis. This approach is expected to be the most conservative (i.e., generate the highest Level 1 score) and, therefore, most protective of each resource. It is not the intention of Ohio EPA to have Level 1 assessments supersede the need to perform Level 2 and Level 3 field assessments when wetland impacts are proposed as part of a 401 WQC or isolated wetlands permit proposal. Rather, the Level 1 score is intended for use as a planning tool, such as when considering multiple corridors for large transportation projects, or when characterizing large watershed areas, as is the case with the IR.

An inner (0 to 100 meters) and outer (100 to 350 meters) buffer was created surrounding the center point for each of the 134,736 NWI wetland polygons in Ohio. Level 1 parameter scores were generated for each of these mapped wetlands and a final Level 1 score calculated using the previously discussed methodology. HUC12 wetland Level 1 assessment scores were then developed for each watershed by first determining the relative area of all NWI wetlands contained within each of these HUC12s. Relative area values were multiplied with the Level 1 scores and summed by HUC12 watershed to calculate an area-weighted Level 1 score for each. A total of five HUC12 watersheds had no mapped NWI wetlands present and these were assigned a Level 1 score of "0."

Preliminary Level 1 scoring ranges were established to approximate the four wetland tiered aquatic life uses previously proposed by Ohio EPA (Mack, 2004). These ranges are based on the quartile distribution of all NWI wetlands in Ohio and are as follows:

1. "Limited Quality Wetland Habitat" (Category 1) = Level 1 scores from 0 to 29.
2. "Restorable Wetland Habitat" (Modified Category 2) = Level 1 scores from 29 to 42.
3. "Wetland Habitat" (Category 2) = Level 1 scores from 42 to 61.
4. "Superior Wetland Habitat" (Category 3) = Level 1 scores from 61 to 100.

The WEG will continue to re-evaluate these Level 1 scoring ranges as more field assessment data on natural wetlands is collected.

Figure 15 depicts all 1,538 watersheds in Ohio based on the area-weighted Level 1 scores, color-coded by the proposed wetland tiered aquatic life use ranges described above.

An analysis was done to compare results of the Level 1 HUC12 watershed characterization with field assessment results (ORAM, VIBI and VIBI-FQ) obtained for natural wetlands in Ohio. Only HUC12 watersheds, which had at least two field assessments conducted, were included in this analysis (N=74). The comparison confirms that a significant statistical relationship exists between the Level 1 and Level 2/Level 3 HUC12 watershed characterizations. This relationship is consistent for VIBI ($p=0.000$, $R^2=34.8$), VIBI-FQ ($p=0.000$, $R^2=30.3$) and ORAM ($p=0.000$, $R^2=32.5$).

Summary Table of Wetland Condition for Ohio's HUC12 Watersheds

The Level 1 analysis documented in this study provides a mechanism for estimating wetland condition on a watershed scale, by generating an area-weighted Level 1 score for each HUC12 watershed in the state. This information, along with data on estimates of overall quantities of historic and current wetland habitat, wetland loss and field assessment data, where it exists, has been summarized for all of the 1,538 HUC12 watersheds in the state (Table 5). No additional random wetland watershed surveys have been conducted since the completion of the 2014 IR, so the information presented in this table has not changed. As new information is generated on Ohio's wetland quantity and quality, this table can be modified for future IRs.

I1.3 Next Steps

Ohio EPA proposes that periodic Level 2 and Level 3 field assessments be conducted on a random selection of wetlands within targeted HUC12 watersheds on a rotating basin schedule, similar to what is currently being done with Ohio EPA stream assessments. Issues such as property access and lack of staff resources will dictate the number of watersheds that can be surveyed, but as the number of HUC12s that have had field assessments conducted increases, a better understanding of the relationship between the Level 1 and Level 2/Level 3 characterizations will be illustrated. This understanding will be critical to the continued improvements to our ability to assess the ecological condition of wetlands using remotely-sensed, landscape-level GIS data. Current staffing resource issues have prevented us from expanding the ecological monitoring program to include regular watershed-scale wetland surveys at this time.

Ohio EPA will be establishing a workgroup of wetland experts to develop criteria for identifying wetlands that would qualify as "special waters." These criteria could include setting specific numeric scores for the Level 1, 2 and 3 assessments, as well as rarity of wetland type and functional capacity within the local

watershed context. One product of this workgroup would be a list of important Ohio wetlands to be included in the IR as being of statewide significance and worthy of extra regulatory protection.

Future research will also focus on improved wetland mapping using the ever-increasing wealth of detailed GIS data, to enhance our ability to more accurately identify the type and extent of wetlands in Ohio.

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Reminder: Tables and figures cited in this section are contained in the I1 Wetlands Supplement located at the end of this section.

I2. Mercury Reduction at Ohio EPA

Mercury is a persistent bioaccumulative toxic metal that is widely used in many products. Once mercury is released into the environment its toxicity, persistence and ability to travel up the food chain are important issues for human health and the environment. Ohio has a statewide health advisory for mercury from fish consumption for sensitive populations: women of childbearing age and children fifteen years old or younger (issued by the Ohio Department of Health).

U.S. EPA is allowing states to identify waters for a special 303(d) list category devoted to mercury issues (5M). While moving in this direction would be preferable as a way to focus on this important pollutant, Ohio EPA has decided that such a move is not possible for this report. At the same time, Ohio EPA is taking action to decrease mercury pollution and these efforts are summarized here.

I2.1 Ohio Law

House Bill 443 was made law on January 4, 2007. The law has the mercury product regulations created initially in House Bill 583 and Senate Bill 323, establishing sales bans for certain mercury products. Public and private schools through high school were not to purchase mercury, mercury compounds or mercury-measuring devices for classroom use as of April 6, 2007. Mercury thermometers and mercury-containing novelty items were not to be sold in Ohio as of October 6, 2007. The sale of novelty items that have mercury cell button batteries were banned as of 2011. Mercury thermostats were not to be sold or installed as of April 6, 2008. There are exemptions to the sales bans.

I2.2 Ohio Projects

Ohio EPA works in several areas seeking to reduce mercury emissions and increase awareness:

- identification of air sources of mercury, including identification of water bodies in the State impaired by mercury predominantly from atmospheric deposition, potential emissions sources contributing to deposition in the State and adoption of appropriate State-level programs to address in-state sources;

- identification of other potential multi-media sources of mercury, such as mercury in products and wastes and adoption of appropriate State-level programs (note that mercury-containing products may be a source of mercury to the air and other media during manufacturing, use or disposal);

- quantifying multi-media mercury reductions achieved by scrubber systems installed at Ohio power plants in response to a lawsuit filed by several northeastern states;

- adoption of statewide mercury reduction goals and targets, including percent reduction and dates of achievement, for air and other sources of mercury, as well as reduction targets for specific categories of mercury sources where possible;

- multi-media mercury monitoring, including water quality, air deposition and air emissions monitoring;

- publicly-owned treatment works with mercury variances implement Pollutant Minimization Programs to identify and reduce sources of mercury that discharge to their plants[1];

- investigating mercury in various types of wastewater, including:

  - primary materials industries, including primary metal production, oil refining and coal facilities;
  - facilities processing steel scrap (continuous casting and steel foundries);
  - publicly-owned treatment works, which looks at indirectly discharging industries through the pretreatment program and facility Pollutant Minimization Plan;
  - coal power plant wastewater from scrubbers, ash ponds and "Low Volume" wastewaters; and
  - other industries in interactive allocation segments to get an accurate accounting of mercury in the segments.

- working to control discharges from the state's one mercury cell sodium/chlorine plant[2];

- public documentation of the State's mercury reduction program in conjunction with the State's IR and public reporting of progress in carrying out the State's programs and reducing in-State mercury sources; and

- coordination across states, where possible, such as multi-State mercury reduction programs. Ohio EPA has representatives in several organizations that work toward this goal.

In addition, several specific projects are underway as described below.

Mercury Collection and Recycling

Mercury collection and recycling occurs at several businesses in Ohio. Names and contact information for these facilities are available on the Ohio EPA mercury recycling vendor website (http://www.epa.ohio.gov/ocapp/Recycle.aspx).

Mercury Switch Removal Program moved to the National Program

In September 2006, Ohio was one of the first states to partner with the National Mercury Vehicle Switch Recycling Program (NMVSRP) to collect automobile mercury switches. Initially Ohio administered the incentive program. While Ohio EPA administered the program, auto recyclers in Ohio collected for recycling 41,310 mercury-containing automobile switches and $123,900 in incentives were awarded. NMVSRP took over all aspects of Ohio's switch collection program in September, 2008 including incentives. Currently Ohio works to direct auto recyclers to the national program and assist them when they have questions.

[1] The facilities track implementation of mercury reduction measures and monitor influent and effluent mercury levels. They facilities compile reduction information and submit annual progress reports to Ohio EPA.

[2] The current consent order includes reducing fugitive air emissions that have contributed to storm water discharges of mercury. The plant will be scrubbing cell emissions with water and sending those discharges to the plant's zero discharge process treatment system. The consent order also requires the company to track mercury mass balances through the facility, and recycle where possible. This includes using collected storm water as process water make-up

Ohio Good DEED Program

The Ohio Dental Association (ODA) initiated the Good DEED (Dedicated to Environmental Excellence in Dentistry) program on May 31, 2010. It is a voluntary program that uses a tiered approach to recognize dental offices that minimize the environmental impact of their practices on Ohio's environment. It includes: comprehensive on-line checklists to identify American Dental Association best management practices (BMPs); environmental regulations that apply specifically to dental offices; and BMPs to help a business be more sustainable and preserve and protect natural resources.

Ohio Hospital Project

Ohio EPA works with the Ohio Hospital Association to reduce the generation of hospital waste, including mercury, which hospitals commonly have in thermometers, blood pressure monitors and other equipment. A formal agreement between the two organizations was signed as part of Ohio Pollution Prevention Week, September 20-24, 1999. The Ohio Healthy Hospitals Pollution Prevention Initiative is based on a federal agreement signed by U.S. EPA and the American Hospital Association. The goal of the program is to provide tools to support hospitals' continued efforts to minimize the production of pollutants and reduce the amount of waste generated.

I2.3 Interagency Groups

Members of Ohio EPA are involved in several collaborative groups with representatives from various organizations and agencies. Some of these groups include the following:

- *Great Lakes Regional Collaboration (GLRC)* – formed with members from the federal Great Lakes Interagency Task Force, the Council of Great Lakes Governors, the Great Lakes Cities Initiative, Great Lakes tribes and the Great Lakes Congressional Task Force. The group includes members from non-governmental organizations and other interests in the Great Lakes Region. The GLRC created a strategy (released in December 2005) to restore the Great Lakes basin. Most recently the GLRC released a draft document that describes a strategy to phase-down mercury in products within the Great Lakes drainage area, which includes a portion of northern Ohio. In 2014 the GLRC released a draft progress report.

- *Binational Toxics Strategy Mercury Workgroup* – the Binational Toxics Strategy Mercury Workgroup is comprised of representatives from state governments, the United States and Canadian federal governments and several environmental groups. Its purpose is to set mercury reduction goals applicable to the aggregate of releases to the air nationwide and of releases to the water within the Great Lakes Basin.

- *Ohio River Valley Water Sanitation Commission (ORSANCO) National Pollutant Discharge Elimination System (NPDES) Workgroup* – this on-going workgroup developed a common framework for monitoring power plant ash pond and scrubber discharges for low-level mercury. These data will be used, along with ORSANCO's mixing zone phase-out, to reduce mercury discharges to the Ohio River.

- *Quicksilver Caucus* – the Quicksilver Caucus (QSC) was formed in May 2001 by a coalition of state environmental association leaders to collaboratively develop holistic approaches for reducing mercury in the environment. QSC members who share mercury-related technical and policy information include the Environmental Council of the States (ECOS), the Association of State and Territorial Solid Waste Management Officials (ASTSWMO), the National Association of Clean Air

Agencies (NACAA), the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA), the Association of State Drinking Water Administrators (ASDWA) and the National Pollution Prevention Roundtable (NPPR). The QSC's long-term goal is that state, federal and international actions result in net mercury reductions to the environment. The QSC is working collaboratively and in partnership in three priority areas:

- stewardship approaches for reducing mercury in the environment and managing safe, long- term storage of elemental mercury nationally and internationally
- multi-media approaches for a mercury-based TMDL taking into account the contributions of the air and waste program as well as using their statutes to craft solutions
- approaches to decrease the global supply and demand for mercury.

In 2013, the QSC developed a report that explored the problems associated with mercury occurring in select products, processes and technologies not yet thoroughly examined by experts in the field, such as tattoo inks and nanomaterials. Development of the report was supported by a grant from U.S. EPA.

- *Ohio Sport Fish Consumption Advisory* – the current Ohio Sport Fish Tissue Monitoring Program has monitored contaminants in sport fish since 1993. Three state agencies participate: the ODNR, Ohio EPA and the Ohio Department of Health (ODH). Both ODNR and Ohio EPA collect fish throughout Ohio's jurisdictional waters. Ohio EPA analyzes the fish samples, reviews the data and issues fish consumption risk assessment evaluations. ODH releases fish consumption advisory issuance information to the public and provides fish consumption information to Ohio citizens as part of the Women's, Infant's and Children's (WIC) and the Help Me Grow (HMG) Programs' activities. Information is distributed where fishing licenses are sold, through pamphlets available in four languages and via the Internet. More information on fish advisories can be found online at http://www.epa.ohio.gov/dsw/fishadvisory/index.aspx.

I2.4 Ohio Resources

A number of videos, fact sheets and presentations are available on Ohio EPA's website that relate to mercury. These include household mercury fact sheets; an introduction to mercury issues; a guide for dealing with mercury by school administrators; an informational sheet for building awareness of mercury in schools; information about mercury in industry; and suggestions for developing a community mercury reduction program. See http://epa.ohio.gov/ocapp/p2/mercury_pbt/mercury.aspx for more information.

I3. Inland Lakes and Reservoirs

Ohio EPA initiated a renewed monitoring effort for inland lakes in 2008. This report assesses three of the four beneficial uses that apply to inland lakes: recreation, public drinking water supply and human health (via fish tissue). Ohio EPA is in the process of updating the water quality standards rules for lakes. Once these rule updates are complete, Ohio EPA expects to include an assessment of the aquatic life use for lakes as a factor in listing watershed or large river assessment units in future CWA Section 303(d) lists. This section outlines the current status of the monitoring effort for inland lakes; summarizes needed administrative rule changes; and previews a potential methodology for assessing the lake habitat aquatic life use in future 303(d) lists. The section was first introduced in 2010 and has not changed appreciably since 2010 because the administrative rule changes have not yet occurred. Ohio EPA intends to continue

monitoring inland lakes and reporting results in future cycles.

I3.1 Background of Ohio's Inland Lake Water Quality Monitoring Program

Ohio EPA's work to assess lakes began in 1989 with a CWA Section 314 Lake Water Quality Assessment grant that supported the evaluation of 52 lakes. Various additional grants enabled the evaluation of 89 more lakes through 1995. An analysis and determination of beneficial use status for 447 public lakes (greater than five acres in surface area) was presented in Volume 3 of the 1996 Ohio Water Resource Inventory [305(b) report]. As part of that report, Ohio EPA developed and applied the Lake Condition Index (LCI) to characterize overall lake health and to assess beneficial use status.

After dedicated U.S. EPA funding for lakes monitoring ended, Ohio EPA monitored only 53 lakes over the next 10 years. The Ohio LCI, developed by Ohio EPA between 1990 and 1996 to report on the status of lake condition in Ohio, became obsolete with the passage of Ohio's Credible Data Law [House Bill 43 (amended), effective 10/21/2003]. This law requires that all decisions on impairment for surface waters (streams, lakes wetlands) use only level 3 credible data. Ohio's LCI assessment process included a combination of level 2 and level 3 credible data to make impairment decisions.

Ohio EPA began researching ways to re-establish a lakes monitoring program in 2005. During the 2007 field season, Ohio EPA participated in the U.S. EPA-sponsored National Lakes Survey. Ohio was assigned 19 lakes that were selected through a probability-based random selection process. The effort served as a precursor for renewed lake sampling program in Ohio.

I3.2 Status of Inland Lakes Program

Ohio EPA currently has resources to monitor up to 16 lakes per year using the strategy described in Section 13.2.1 below. Priority is being placed on lakes used for public drinking water or used heavily for recreation and suspected of being impaired for either of those uses. Secondary priorities still on the horizon because of limited resources include developing a more robust sampling program, expanding to a wider variety of lakes, exploring the use of remote sensing in the screening of water quality in lakes and attempting to track water quality changes in lakes that might be attributed to Section 319 funding and other watershed water quality improvement efforts. The objectives for monitoring inland lakes are to:

- Track status and trends of lake quality
- Determine attainment status of beneficial uses
- Identify causes and sources of impaired uses
- Recommend actions for improving water quality in impaired lakes

In this report, Ohio EPA discusses lake use impairment for recreation, public drinking water and human health (fish tissue) and previews a methodology for including inland lakes in the aquatic life use listing. The aquatic life use listing is dependent on the rule changes to Ohio's water quality standards, which include adoption of nutrient criteria. Once the criteria are adopted into Ohio's water quality standards rules, Ohio EPA expects to be able to definitively report on the status of the aquatic life use of lakes sampled through 2014.

I3.2.1 Lake Sampling – Lake Habitat Aquatic Life Use Assessment

Ohio EPA has implemented a sampling strategy that focuses on evaluating the water quality conditions

present in the epilimnion of lakes. The sampling target consists of an even distribution of a total of ten sampling events divided over a two-year period and collected during the summer months. Key water quality parameters sampled include total phosphorus, total nitrogen, chlorophyll a, Secchi depth, ammonia, dissolved oxygen, pH, total dissolved solids and various metals such as lead, mercury and copper. Details of the sampling protocol are outlined in the Inland Lakes Sampling Procedure Manual, available on Ohio EPA's web page at: http://www.epa.ohio.gov/dsw/inland_lakes/index.aspx.

I3.2.2 Water Quality Standards for the Protection of Aquatic Life in Lakes

Presently, lakes in Ohio are designated as exceptional warmwater habitat (EWH) with respect to the aquatic life habitat use designation. Revisions to Ohio's WQS that would change the aquatic life use from EWH to lake habitat (LH) are in progress. A primary reason for this revision is that in Ohio, a set of biological criteria apply to rivers and streams, whereas no biocriteria apply to lakes. The numeric chemical criteria to protect the LH use will remain the same as the criteria to protect the EWH use that currently applies to lakes, with a suite of nutrient criteria added. A set of numeric criteria that apply to all surface waters for the protection of aquatic life, regardless of specific use designation, will also apply to inland lakes and are referred to as "base aquatic life use criteria" in the proposed WQS rules. The base aquatic life use criteria will be the same aquatic life numeric criteria that currently apply to lakes. Examples include various metals such as copper, lead and cadmium as well as organic chemicals such as benzene and phenol. Specific details concerning the revisions to the water quality standards rules can be reviewed on Ohio EPA's web page at the following address:
http://www.epa.ohio.gov/dsw/rules/draftrules.aspx.

The chemical criteria specific to the LH aquatic life use in the proposed water quality standards rules are depicted in Table I-1. In addition to these parameters, the base aquatic life use criteria that apply to lakes and can be reviewed on Ohio EPA's web page at:
http://www.epa.ohio.gov/portals/35/rules/draft_1-42new_base%20ALU%20criteria_aug08.pdf.

Table I-1. Proposed[1] lake habitat use criteria.
Note: All criteria are outside mixing zone averages unless specified differently.

Parameter Lake type	Form[2]	Units[3]	Statewide criteria	Ecoregional Criteria[4] ECBP	EOLP	HELP	IP	WAP
Ammonia	T	mg/L	Table 43-4	--	--	--	--	--
Chlorophyll a [5]								
Dugout lakes	T	µg/L	6.0	--	--	--	--	--
Impoundments	T	µg/L	--	14.0	14.0	14.0	14.0	6.2
Natural lakes	T	µg/L	14.0	--	--	--	--	--
Upground reservoirs	T	µg/L	6.0	--	--	--	--	--
Dissolved oxygen [6] All lake types	T	mg/L	5.0 OMZM 6.0 OMZA	--	--	--	--	--
Nitrogen [5]								
Dugout lakes	T	µg/L	450	--	--	--	--	--
Impoundments	T	µg/L	--	930	740	930	688	350
Natural lakes	T	µg/L	638	--	--	--	--	--
Upground reservoirs	T	µg/L	1,225	--	--	--	--	--
pH All lake types	--	s.u.	A	--	--	--	--	--
Phosphorus [5]								
Dugout lakes	T	µg/L	18	--	--	--	--	--
Impoundments	T	µg/L	--	34	34	34	34	14
Natural lakes	T	µg/L	34	--	--	--	--	--
Upground reservoirs	T	µg/L	18	--	--	--	--	--
Secchi disk transparency [7]								
Dugout lakes	--	m	2.60	--	--	--	--	--
Impoundments	--	m	--	1.19	1.19	1.19	1.19	2.16
Natural lakes	--	m	1.19	--	--	--	--	--
Upground reservoirs	--	m	2.60	--	--	--	--	--
Temperature All lake types	--	--	B	--	--	--	--	--

[1] Proposed in draft water quality standards rules, August 2008.
[2] T = total.
[3] m = meters; mg/L = milligrams per liter (parts per million); µg/L = micrograms per liter (parts per billion); s.u. = standard units.
[4] ECBP stands for Eastern Corn Belt Plains; EOLP stands for Erie/Ontario Lake Plain; HELP stands for Huron/Erie Lake Plains; IP stands for Interior Plateau; and WAP stands for Western Allegheny Plateau.
[5] These criteria apply as lake medians from May through October in the epilimnion of stratified lakes and throughout the water column in unstratified lakes.
[6] For dissolved oxygen, OMZM means outside mixing zone minimum and OMZA means outside mixing zone minimum twenty-four-hour average. The dissolved oxygen criteria apply in the epilimnion of stratified lakes and throughout the water column in unstratified lakes.
[7] These criteria apply as minimum values from May through October.
A pH is to be 6.5-9.0, with no change within that range attributable to human-induced conditions.
B At no time shall the water temperature exceed the average or maximum temperature that would occur if there were no temperature change attributable to human activities.

I3.3 Preview of Future Listings

An important distinction between assessment of aquatic life uses of rivers and streams in Ohio versus lakes is that the former relies on biological monitoring and a comparison of those results to the biological criteria as the assessment tool. Ohio does not have biological criteria that apply to lakes. As a result, the assessment methodology for the lake habitat aquatic life use will rely solely on the results of water

quality sampling and a comparison of the results to the applicable numeric criteria. This is an obvious and important difference to the weight-of-evidence approach traditionally used by Ohio for rivers and streams.

I3.3.1 Methodology Preview: Lake Habitat Use Assessment

The following protocol is intended to be used to determine the attainment status of the LH aquatic life use in a future IR. This is dependent upon the completion of the WQS rulemaking currently in progress, which provide the foundational components necessary to complete the actual assessment process. The proposed protocol for assessing the LH aquatic life use designation for the purpose of this preview is outlined as follows:

1) Comparison of individual sample concentrations for any base aquatic life use parameter sampled to the base aquatic life outside mixing zone average (OMZA) numeric criterion. If more than 10 percent of the samples within an assessment period (typically two years) exceed the OMZA numeric criterion, the LH use is considered to be impaired.
2) Comparison of the ammonia concentrations of the lake samples collected to the LH OMZA numeric criterion. The LH use is considered to be impaired if more than 10 percent of the individual samples exceed the OMZA.
3) Comparison of the average dissolved oxygen content of the epilimnetic samples of a thermally stratified lake (or samples throughout the water column of an unstratified lake) to the OMZA dissolved oxygen criteria for the LH use designation. If more than 10 percent of the average dissolved oxygen values do not meet the OMZA criterion, the LH use is considered to be impaired.
4) Comparison of the median pH value of the epilimnetic samples of a thermally stratified lake (or samples from throughout the water column of an unstratified lake) to the OMZA pH criteria for the LH use designation. If more than 10 percent of the median pH values do not meet the OMZA criterion, the LH use is considered to be impaired.
5) Comparison of the median chlorophyll a concentration of the samples collected over the sample period (typically two consecutive summers) to the applicable chlorophyll a criterion for the type of lake and ecoregion in which the lake is located. The LH use is considered to be impaired if the median chlorophyll a concentration exceeds the applicable chlorophyll a criterion.
6) Total phosphorus, total nitrogen and Secchi depth parameters are used to flag potential impairment of the LH aquatic life use designation. Exceedance of these nutrient criteria is determined in a manner similar to that described for chlorophyll a. However, exceedances of the criteria for these parameters will trigger listing on the state's "watch list" rather than a determination of use impairment. Lakes listed on the watch list will be factored into the prioritization process for additional monitoring.

I3.3.2 Results

Table I3-2 describes the assessment status of the LH aquatic life use designation for thirteen lakes sampled by Ohio EPA in 2013-2014 based on the protocol outlined in the previous section.

Table I-2. Summary of the lake habitat use assessment for lakes sampled in 2013-2014 using the draft assessment methodology described in this section.
Note: Values in red represent an exceedance of criteria resulting in a determination of non-support of the lake habitat aquatic life use designation. Values in yellow represent a watch list designation.

Lake	Eco-region[3]	Lake Type[2]	Lake Habitat Use Status	Tiered Aquatic Life Criteria							Base Aquatic Life Criteria[1] (Units are percentages)									
				chl. *A* (µg/L)	t-P (µg/L)	t-N (µg/L)	Secchi (m)	D.O (%)	pH (%)	NH_3 (%)	TDS	As	Hg	Se	Cd	Cr	Cu	Pb	Ni	Zn
				Seasonal Median Values				Percentage of Samples Exceeding the OMZA Criterion												
Alum Creek Reservoir L-1	ECBP	DPI	Watch	11.6	11	1560	1.74	10	-	-	-	-	-	-	-	-	-	-	-	-
Barton	ECBP	DO	Non-Support	13.8	15.4	1900	2.05	0	-	-	-	-	-	-	-	-	-	-	-	-
Hoover Reservoir L-1	ECBP	DPI	Non-support	33.7	25	1455	1.24	40	-	-	-	-	-	-	-	-	-	-	-	-
McKarns	ECBP	DO	Non-Support	6.7	5.7	820	1.69	10	10	-	-	-	-	-	-	-	-	-	-	-
Metzger	ECBP	UP	Non-Support	11.1	23.5	2035	1.35	9	18	-	-	-	-	-	-	-	-	-	-	-
Nettle	ECBP	NL	Non-Support	41.9	28	1145	0.84	30	-	-	-	-	-	-	-	-	-	-	-	-
Winton Lake L-1	ECBP	DPI	Non-Support	45.7	34	690	0.440	30	-	-	-	-	-	-	-	-	-	-	-	-
Clear Fork	EOLP	DPI	Non-Support	17.7	17.5	615	1.20	-	-	-	-	-	-	-	-	-	-	10	-	-
Findley Lake	EOLP	DPI	Non-Support	35.9	52	1390	0.76	-	10	-	-	-	-	-	-	-	-	-	-	-
Wellington Upground Reservoir	EOLP	UP	Support	2.4	5	850	5.42	-	-	-	-	-	-	-	-	-	-	-	-	-
Summit Lake	EOLP	NL	Non-Support	30.5	30	1480	1.05	-	10	-	-	-	-	-	-	-	-	-	-	-

Lake	Eco-region[3]	Lake Type[2]	Lake Habitat Use Status	Tiered Aquatic Life Criteria							Base Aquatic Life Criteria[1] (Units are percentages)									
				chl. *A* (µg/L)	t-P (µg/L)	t-N (µg/L)	Secchi (m)	D.O (%)	pH (%)	NH_3 (%)	TDS	As	Hg	Se	Cd	Cr	Cu	Pb	Ni	Zn
				Seasonal Median Values				Percentage of Samples Exceeding the OMZA Criterion												
Mosquito Lake	EOLP	DPI	Non-Support	27.4	17	1930	0.77	-	-	-	-	-	-	-	-	-	-	-	-	-
Archbold #2	HELP	UP	Non-Support	31.2	29	925	0.8	22	-	-	-	-	-	-	-	-	-	-	-	-
Beaver Creek	HELP	UP	Non-Support	20.8	14	2355	1.36	-	60	-	-	-	-	-	-	-	-	-	-	-
Olander	HELP	DO	Non-Support	3.6	13	520	2.74	-	-	-	-	-	-	-	-	-	50	-	-	-
Vets Memorial	HELP	UP	Non-Support	10.5	18	1830	2.11	-	10	-	-	-	-	-	-	-	-	-	-	-
Piedmont Lake L-1	WAP	DPI	Non-Support	14.9	12.5	495	1.32	20	-	-	-	-	-	-	-	-	-	-	-	-
Piedmont Lake L-2	WAP	DPI	Non-Support	20.1	17	470	1.0	11	-	-	-	-	-	-	-	-	-	-	-	-
Clendening Lake L-1	WAP	DPI	Non-Support	20.5	19	600	0.92	70	-	-	-	-	-	-	-	-	-	-	-	-
Clendening Lake L-2	WAP	DPI	Non-Support	48.3	31	750	0.74	33	-	-	-	-	-	-	-	-	-	-	-	-
Tappan Lake L-1	WAP	DPI	Non-support	28.7	21	705	0.92	70	-	-	-	-	-	-	-	-	-	-	-	-
Tappan Lake L-2	WAP	DPI	Non-Support	44.3	44	600	0.73	22	-	-	-	-	-	-	-	-	-	-	-	-

[1] Represent parameters typically included in a standard lake assessment; additional parameters sampled as necessary.
[2] DPI = impoundment; UP = upground reservoir
[3] ECBP = Eastern Corn Belt Plains; EOLP = Erie/Ontario Lake Plain; WAP = Western Allegheny Plateau; HELP = Huron/Erie Lake Plain

Supplement to I1: Wetlands

Table 1. Middle Scioto TMDL area wetland sampling locations and assessment results.

Site ID	Area (acres)	Cowardin Code	Wetland Type	Longitude	Latitude	Year	ORAM	ORAM Category	VIBI	VIBI-FQ
001	0.141782	PEMA	Emergent	-82.984923	39.663640	2010	46.5	2	20.0	38.46
002	0.339731	PEMA	Emergent	-82.917595	39.653383	2010	19.0	1	NA	NA
003	1.408849	PFO1A	Forested	-82.942855	39.775317	2010	55.0	2	51.0	54.51
004	0.524567	PFO1A	Forested	-83.207457	40.087042	2010	67.0	3	50.0	65.27
005	2.696891	PEMF	Emergent	-82.953631	39.657259	2010	25.5	1	20.0	3.14
007	0.168155	PFO1A	Forested	-83.011713	39.717394	2012	49.5	2	NA	NA
010	2.156009	PFO1A	Forested	-83.090507	40.012178	2010	55.5	2	39.0	50.39
018	0.263096	PFO1C	Forested	-83.196193	40.091401	2010	53.0	2	46.0	42.47
021a	0.288798	PEMA	Forested	-82.967032	39.640970	2010	56.5	2	37.0	54.20
021b	0.288798	PFO1C	Forested	-82.967032	39.640970	2010	56.5	2	24.0	30.95
022	0.656775	PEMC	Emergent	-83.148378	40.037223	2010	17.0	1	NA	NA
023	1.282204	PEMC	Emergent	-83.024939	39.797035	2010	20.0	1	23.0	23.02
027	1.397674	PEMCh	Emergent	-83.147735	40.242136	2010	78.5	3	87.0	80.16
032	3.235745	PFO1A	Forested	-83.147648	40.096604	2012	38.0	Modified 2	NA	NA
035	2.898011	PFO1C	Forested	-82.999048	39.758032	2012	40.0	Modified 2	NA	NA
039	0.539485	PEMC	Emergent	-83.034916	39.814682	2010	44.5	Modified 2	NA	NA
046	0.795345	PSS1A	Scrub-Shrub	-83.013304	39.837746	2010	36.0	Modified 2	NA	NA
049	0.313442	PEMC	Emergent	-83.130584	40.063475	2010	31.0	Modified 2	NA	NA
055	0.246014	PEMC	Emergent	-83.006404	39.704656	2012	58.0	2	NA	NA
057	0.836275	PFO1C	Forested	-82.980092	39.788585	2012	26.5	1	NA	NA
058	7.202414	PEMF	Emergent	-83.179563	40.123408	2012	34.0	Modified 2	NA	NA
061	0.665624	PEMC	Emergent	-82.984701	39.757018	2012	19.5	1	NA	NA
063	1.226248	PFO1C	Forested	-82.965852	39.633597	2012	46.5	2	NA	NA
065	0.920317	PSS1A	Scrub-Shrub	-83.013545	39.839326	2010	36.0	Modified 2	NA	NA
066	0.345344	PFO1Ch	Forested	-83.139081	40.223813	2012	65.0	3	NA	NA
068	2.146569	PEMA	Emergent	-83.193861	40.158959	2012	32.0	Modified 2	NA	NA
070	7.592747	PEMA	Emergent	-83.192748	40.135375	2012	34.0	Modified 2	NA	NA
080	0.422843	PEMA	Emergent	-83.173466	40.042730	2012	41.0	Modified 2	NA	NA
082	2.914693	PFO1C	Forested	-83.118882	40.138979	2012	59.5	2	NA	NA
083	1.472093	PFO1C	Forested	-82.993426	39.692750	2012	43.0	Modified 2	NA	NA
085	2.115701	PEMC	Emergent	-82.998634	39.764321	2010	38.5	Modified 2	NA	NA
093	0.790332	PEMA	Emergent	-82.985074	39.678746	2012	23.0	1	NA	NA
100	0.786114	PFO1Ch	Forested	-83.148172	40.238271	2010	63.5	3	NA	NA
102	1.263845	PEMC	Emergent	-83.179476	40.126988	2012	35.0	Modified 2	NA	NA
110	0.289190	PEMA	Emergent	-83.087153	39.812020	2012	16.5	1	NA	NA
111	1.238872	PEMC	Emergent	-83.132005	40.050792	2012	21.0	1	NA	NA
118	0.391229	PEMF	Emergent	-83.186730	40.132209	2012	32.0	Modified 2	NA	NA
127	0.550798	PEMB	Emergent	-83.162972	40.054918	2012	38.0	Modified 2	NA	NA
133	1.669319	PSS1/EMA	Forested	-83.182024	40.169233	2012	38.0	Modified 2	NA	NA
141	0.132831	PEMC	Emergent	-83.097320	40.075305	2012	29.0	1	NA	NA
143	1.267044	PFO1C	Forested	-83.162005	40.026384	2012	23.5	1	NA	NA
152	6.293975	PFO1A	Forested	-82.990653	39.672087	2012	47.5	2	NA	NA
154	13.171259	PEMF	Emergent	-83.029233	39.831977	2012	39.0	Modified 2	NA	NA
156	0.562334	PFO1A	Forested	-82.991483	39.692957	2012	52.5	2	NA	NA
162	1.991427	PFO1C	Forested	-82.956359	39.794947	2012	30.5	Modified 2	NA	NA
163	0.636226	PEMA	Emergent	-82.859910	39.664079	2012	17.5	1	NA	NA
165	0.377591	PFO1A	Forested	-83.192512	40.086443	2012	52.5	2	NA	NA
181	1.276208	PFO1A	Forested	-83.188820	40.185339	2012	66.0	3	NA	NA
184	8.235739	PSS1/EMC	Scrub-Shrub	-82.973660	39.671237	2012	33.0	Modified 2	NA	NA
193	0.305039	PFO1C	Forested	-83.199665	40.156235	2012	67.5	3	NA	NA
194	0.306308	PEMC	Emergent	-83.116325	40.237183	2012	22.0	1	NA	NA

Table 2. Comparison of various landscape parameters with Ohio EPA Wetland Ecology Group field assessment data collected on natural wetlands in Ohio.

Parameter	VIBI (N=298)		VIBI-FQ (N=298)		ORAM (N=291)	
	R-Sq	P	R-Sq	P	R-Sq	P
LDI 1992 NLCD (0 to 100 meter buffer)	18.9	0	19	0	31	0
LDI 1992 NLCD (100 to 350 meter buffer)	21.6	0	15.7	0	29.6	0
LDI 2006 NLCD (0 to 100 meter buffer)	19	0	20.2	0	28.1	0
LDI 2006 NLCD (100 to 350 meter buffer)	20.5	0	17.7	0	26.2	0
Impervious Surface Percent based on 2006 NLCD (0 to 100 meter buffer)	9.3	0	6.9	0	11.8	0
Impervious Surface Percent based on 2006 NLCD (100 to 350 meter buffer)	13	0	10.6	0	16.9	0
Forest Canopy Percent based on 2001 NLCD (0 to 100 meter buffer)	15.6	0	21	0	22.4	0
Forest Canopy Percent based on 2001 NLCD (100 to 350 meter buffer)	19.2	0	17.4	0	23.5	0
Historic Forest Percent based on DRG (0 to 100 meter buffer)	13	0	22.2	0	19.5	0
Historic Forest Percent based on DRG (100 to 350 meter buffer)	23	0	23.4	0	24.5	0
Natural Land Uses - Human Land Uses derived from 1992 NLCD (0 to 100 meter buffer)	16.1	0	17.9	0	23	0
Natural Land Uses - Human Land Uses derived from 1992 NLCD (100 to 350 meter buffer)	22	0	16.4	0	25.9	0
Natural Land Uses - Human Land Uses derived from 2006 NLCD (0 to 100 meter buffer)	20.6	0	23.5	0	28.7	0
Natural Land Uses - Human Land Uses derived from 2006 NLCD (100 to 350 meter buffer)	22.6	0	20.3	0	27.6	0
Population Density derived from 1990 US Census (0 to 100 meter buffer)	6.6	0	3.7	0.001	4.5	0
Population Density derived from 1990 US Census (100 to 350 meter buffer)	7	0	4.7	0	5.3	0
Population Density derived from 2010 US Census (0 to 100 meter buffer)	6.2	0	4.7	0	5.7	0
Population Density derived from 2010 US Census (100 to 350 meter buffer)	6.6	0	5.3	0	6.3	0
SSURGO Sand/Muck Soils or ODNR Rare Plant Species (0 to 100 meter buffer)	12.8	0	18.1	0	8.4	0
SURGO Sand/Muck Soils or ODNR Rare Plant Species (100 to 350 meter buffer)	11.3	0	13.7	0	6	0

Table 3. Metric scoring ranges for parameters included in the Ohio EPA level 1 wetland assessment.

Parameter	Parameter Category	Metric Score = 0	Metric Score = 3	Metric Score = 7	Metric Score = 10
LDI 1992 NLCD (0 to 100 meters)	*Historic*	*2.663020 - 7.158644*	*1.475001 - 2.663019*	*1.052693 - 1.475000*	*1.000000 - 1.052692*
LDI 1992 NLCD (100 to 350 meters)	*Historic*	*3.496929 - 6.415488*	*2.239654 - 3.496928*	*1.537938 - 2.239653*	*1.000000 - 1.537937*
Historic Forest Percent based on DRG (0 to 100 meters)	*Historic*	*0.000000 - 4.805492*	*4.805493 - 45.333333*	*45.333334 - 81.880734*	*81.880735 - 100.000000*
Historic Forest Percent based on DRG (100 to 350 meters)	*Historic*	*0.000000 - 11.911357*	*11.911358 - 26.481195*	*26.481196 - 49.355005*	*49.355006 - 100.000000*
Natural Land Uses - Human Land Uses derived from 1992 NLCD (0 to 100 meters)	*Historic*	*-100.000000 - 12.000000*	*12.000001 - 63.636364*	*63.636365 - 93.750000*	*93.750001 - 100.000000*
Natural Land Uses - Human Land Uses derived from 1992 NLCD (100 to 350 meters)	*Historic*	*-100.000000 - - 23.394495*	*-23.394494 - 23.113208*	*23.113209 - 62.149533*	*62.149534 - 98.604651*
Population Density derived from 1990 US Census (0 to 100 meters)	*Historic*	*281.477892 - 3878.679689*	*103.357315 - 281.477891*	*49.906198 - 103.357314*	*2.580520 - 49.906197*
Population Density derived from 1990 US Census (100 to 350 meters)	*Historic*	*282.872407 - 3882.098389*	*103.050195 - 282.872406*	*49.906209 - 103.357314*	*2.580525 - 49.906208*
SSURGO Sand/Muck Soils or ODNR Rare Plant Species (0 to 100 meters)	*Historic*	*0.000000*	*0.000001 - 4.988520*	*4.988521 - 11.203282*	*11.203283 - 116.174171*
SURGO Sand/Muck Soils or ODNR Rare Plant Species (100 to 350 meters)	*Historic*	*0.000000*	*0.000001 - 9.406911*	*9.406912 - 46.216751*	*46.216752 - 296.915680*
LDI 2006 NLCD (0 to 100 meters)	*Current*	*3.586079 - 7.133125*	*1.986668 - 3.586078*	*1.000001 - 1.986667*	*1.000000*
LDI 2006 NLCD (100 to 350 meters)	*Current*	*4.201624 - 7.720233*	*2.712825 - 4.201623*	*1.636953 - 2.712824*	*1.000000 - 1.636952*
Impervious Surface Percent based on 2006 NLCD (0 to 100 meters)	*Current*	*5.807693 - 42.173077*	*1.152175 - 5.807692*	*0.000001 - 1.152174*	*0.000000*
Impervious Surface Percent based on 2006 NLCD (100 to 350 meters)	*Current*	*6.007265 - 58.896471*	*0.756441 - 6.007264*	*0.094908 - 0.756440*	*0.000000 - 0.094907*
Forest Canopy Percent based on 2001 NLCD (0 to 100 meters)	*Current*	*0.000000 - 31.687500*	*31.687501 - 58.647059*	*58.647060 - 80.591837*	*80.591838 - 91.755102*
Forest Canopy Percent based on 2001 NLCD (100 to 350 meters)	*Current*	*0.000000 - 22.086047*	*22.086048 - 44.384439*	*44.384440 - 62.288991*	*62.288992 - 90.389277*
Natural Land Uses - Human Land Uses derived from 2006 NLCD (0 to 100 meters)	*Current*	*-100.000000 - - 7.843137*	*-7.843136 - 64.912281*	*64.912282 - 98.076923*	*98.076924 - 100.000000*
Natural Land Uses - Human Land Uses derived from 2006 NLCD (100 to 350 meters)	*Current*	*-100.000000 - - 37.619048*	*-37.619047 - 13.895216*	*13.895217 - 60.879630*	*60.879631 - 100.000000*
Population Density derived from 2010 US Census (0 to 100 meters)	*Current*	*474.845704 - 7340.631348*	*133.767427 - 474.485703*	*59.511338 - 133.767426*	*0.455506 - 59.511337*
Population Density derived from 2010 US Census (100 to 350 meters)	*Current*	*466.085633 - 7284.695801*	*133.223237 - 466.085632*	*58.442479 - 133.223236*	*0.933198 - 58.442478*

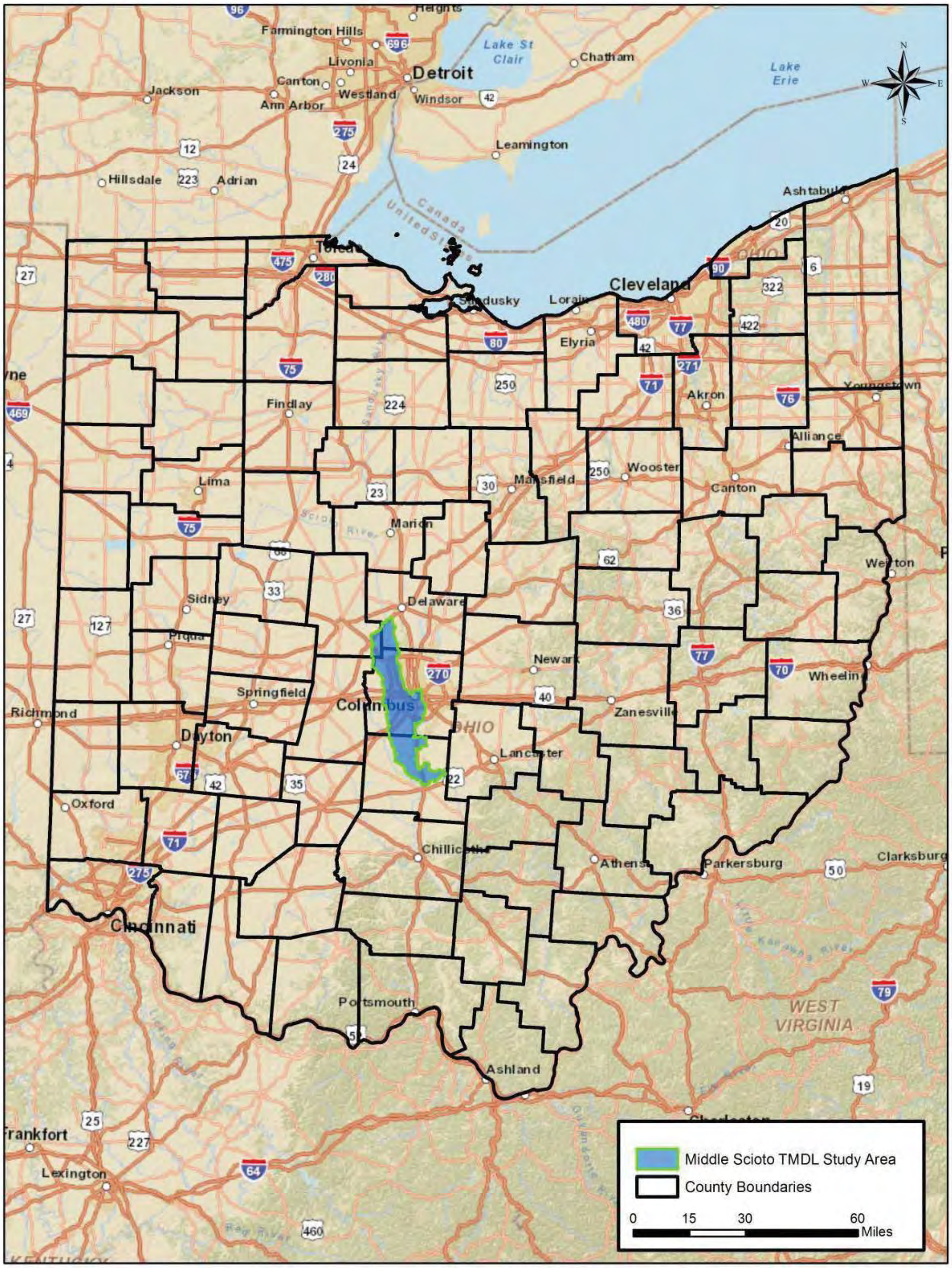


Figure 1. Middle Scioto TMDL study area boundary.

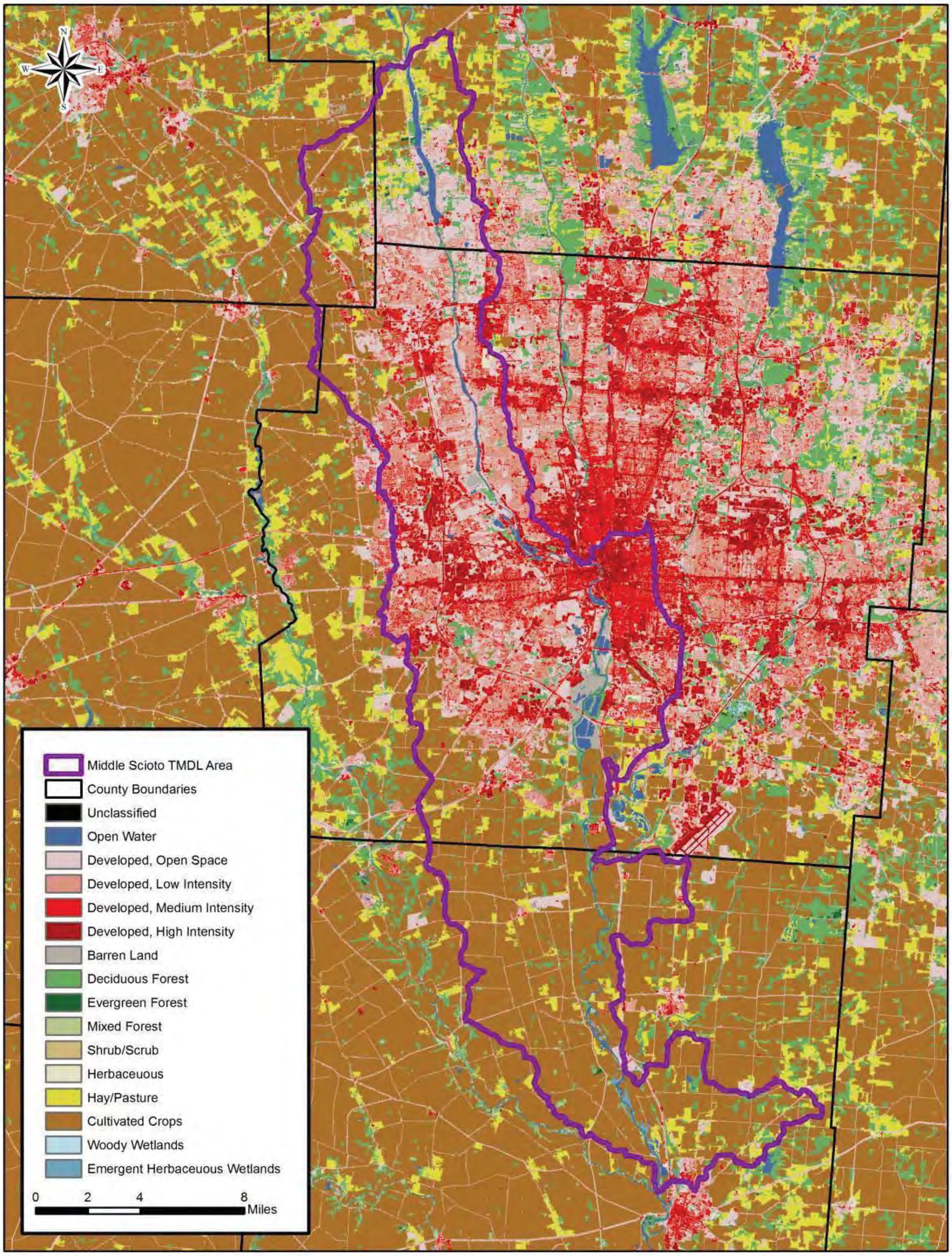


Figure 2. Land use categories, as depicted on the 2006 National Land Cover Dataset (NLCD), for the Middle Scioto TMDL area.

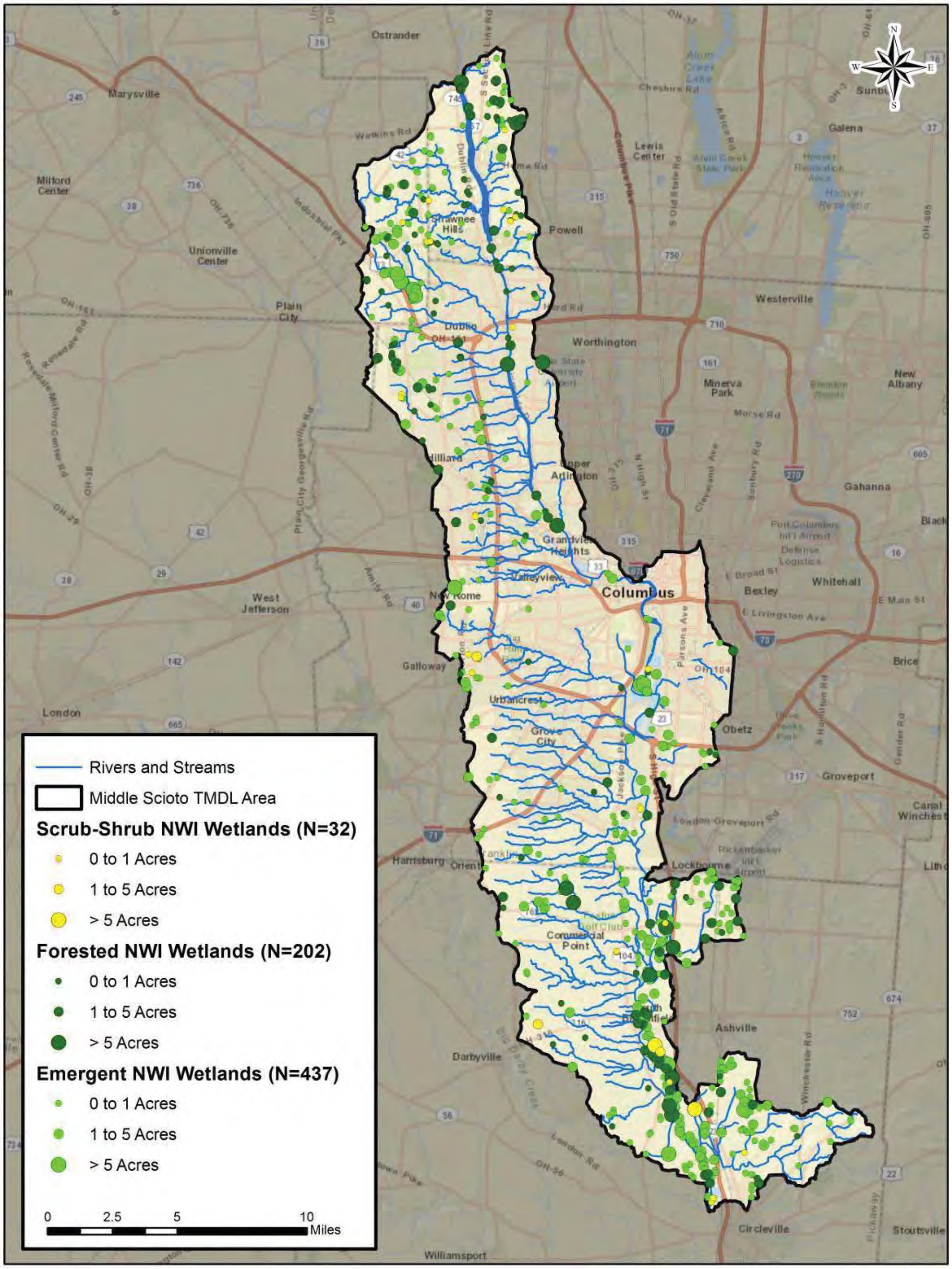


Figure 3. All mapped emergent, scrub-shrub, and forested National Wetland Inventory (NWI) wetlands in the Middle Scioto TMDL area.

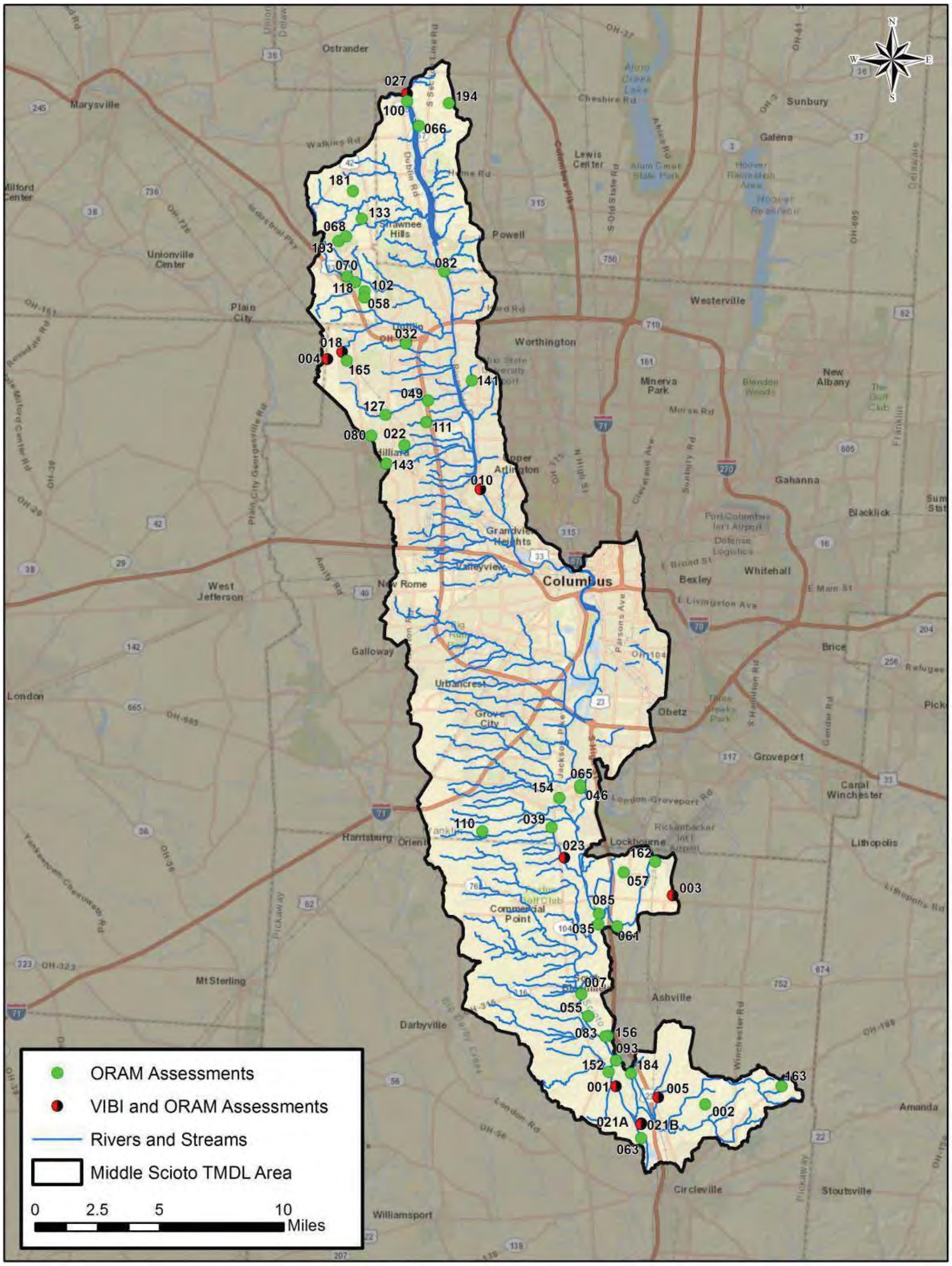
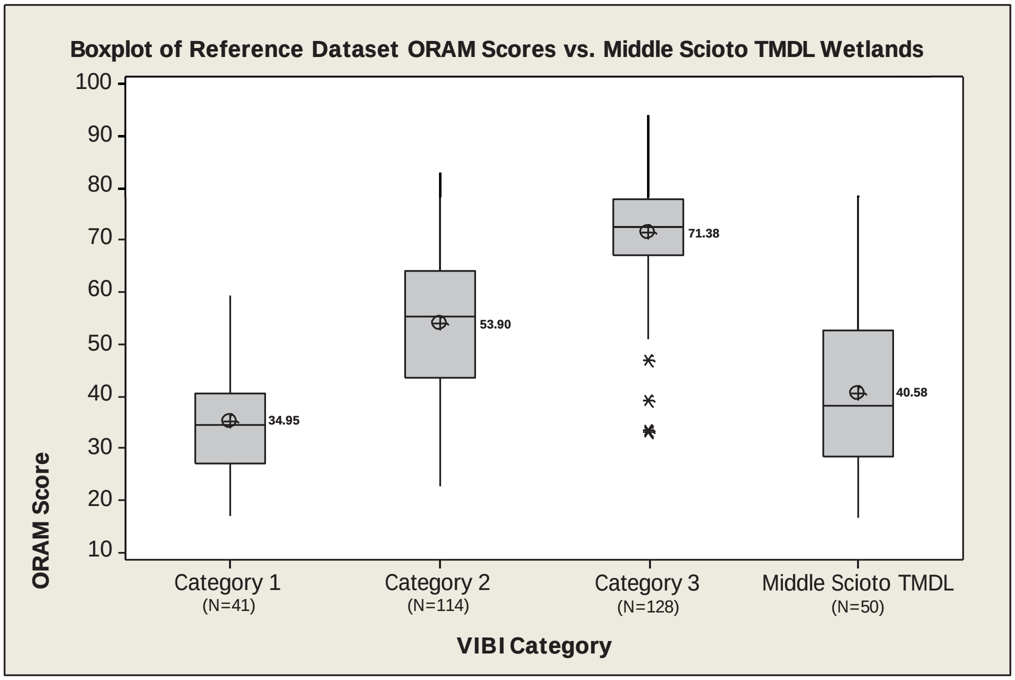


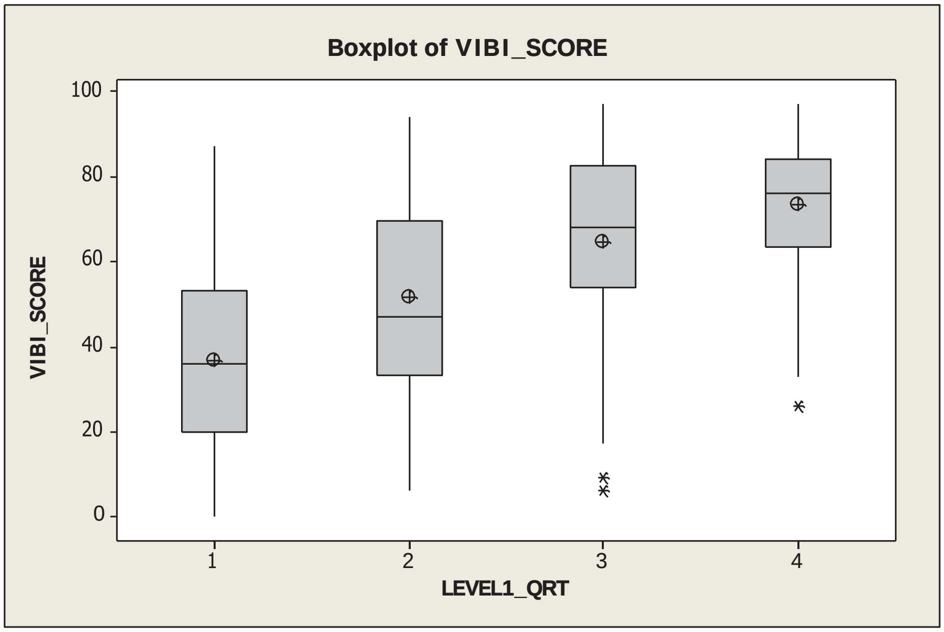
Figure 4. ORAM and VIBI assessment locations in the Middle Scioto TMDL area.




```
Source      DF       SS      MS        F       P
VIBI CAT     3    60816   20272   129.46   0.000
Error      329    51518     157
Total      332   112334
S = 12.51    R-Sq = 54.14%    R-Sq(adj) = 53.72%

Level                  N    Mean   StDev
Category 1            41   34.95   10.91
Category 2           114   53.90   13.09
Category 3           128   71.38   10.72
N220                  50   40.58   16.17

Individual 95% CIs For Mean Based on Pooled StDev

Level       ----+---------+---------+---------+-----
Category 1 (--*--)

Category 2                 (-*-)
Category 3                                (*-)
N220            (--*--)


           ----+---------+---------+---------+-----
              36        48        60        72


Pooled StDev = 12.51

Grouping Information Using Tukey Method

VIBI_CAT               N    Mean  Grouping
Category 3           128   71.38  A
Category 2           114   53.90    B
N220                  50   40.58      C
Category 1            41   34.95      C

Means that do not share a letter are significantly
different.

Tukey 95% Simultaneous Confidence Intervals
All Pairwise Comparisons among Levels of VIBI_CAT
```

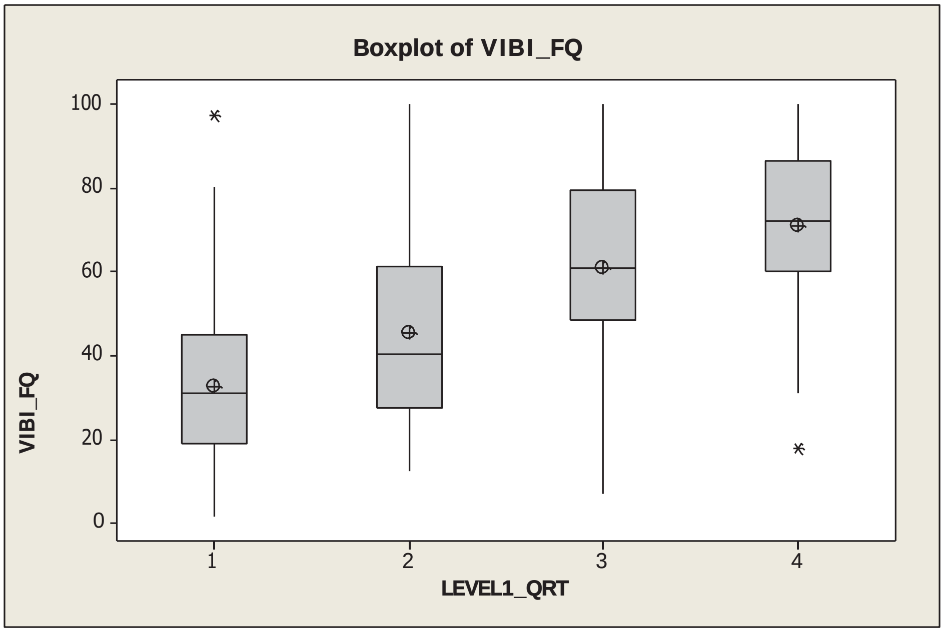
```
Individual confidence level = 98.93%

VIBI_CAT = Category 1            subtracted from:

VIBI_CAT               Lower   Center   Upper
Category 2             13.10    18.95   24.80
Category 3             30.67    36.43   42.20
N220                   -1.14     5.63   12.40

VIBI_CAT    --------+---------+---------+---------+-
Category 2                                (-*--)
Category 3                                        (--*--)

N220                         (---*--)
            --------+---------+---------+---------+-
                  -20         0        20        40


VIBI_CAT = Category 2            subtracted from:

VIBI_CAT                Lower   Center   Upper


Category 3              13.34    17.48   21.62
N220                   -18.77   -13.32   -7.88


VIBI_CAT    --------+---------+---------+---------+-
Category 3                                (-*-)
N220                 (-*--)
            --------+---------+---------+---------+-
                  -20         0        20        40

VIBI_CAT = Category 3            subtracted from:

VIBI_CAT                Lower   Center    Upper
N220                   -36.16   -30.80   -25.45


VIBI_CAT    --------+---------+---------+---------+-
N220        (--*-)
            --------+---------+---------+---------+-
                  -20         0        20        40
```

Figure 5. Boxplot one-way ANOVA (with Tukey's comparison) of ORAM scores for 50 randomly-selected wetland locations in the Middle Scioto TMDL study area compared with ORAM scores recorded by the Ohio EPA Wetland Ecology group for natural wetlands in Ohio, organized by VIBI antidegradation category.



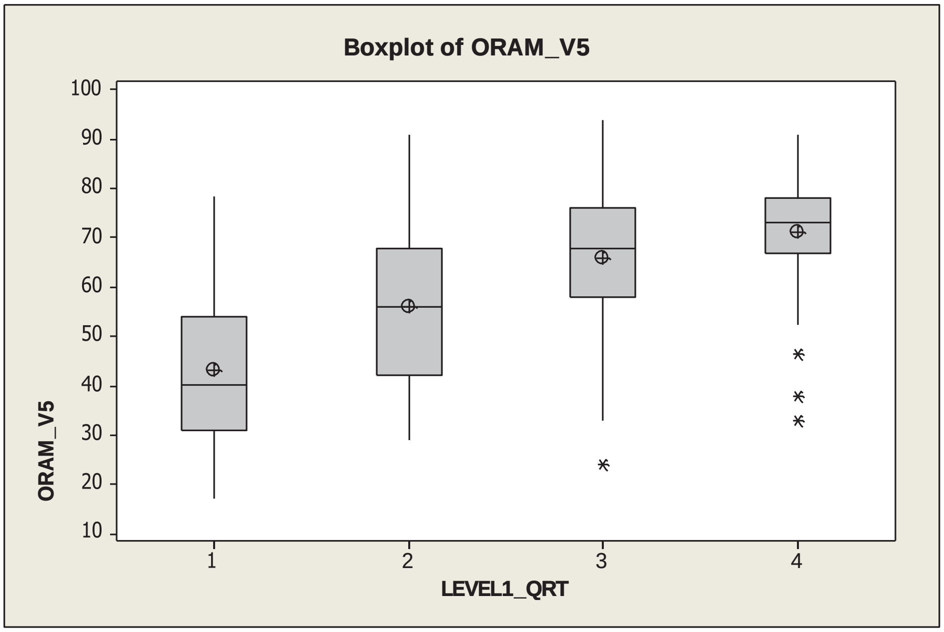

```
Source        DF      SS     MS      F      P
LEVEL1_QRT     3   56567  18856  45.79  0.000
Error        294  121069    412
Total        297  177635


S = 20.29   R-Sq = 31.84%   R-Sq(adj) = 31.15%
                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level   N   Mean  StDev  ---+---------+---------+---------+------
1      79  36.77  19.49  (---*--)
2      76  51.57  22.81              (---*---)
3      74  64.61  21.91                         (---*---)
4      69  73.19  15.97                                (---*---)
                         ---+---------+---------+---------+------
                           36        48        60        72
Pooled StDev = 20.29

Grouping Information Using Tukey Method

LEVEL1_QRT   N   Mean  Grouping
4           69  73.19  A
3           74  64.61  A
2           76  51.57    B
1           79  36.77      C

Means that do not share a letter are significantly different.

Tukey 95% Simultaneous Confidence Intervals
All Pairwise Comparisons among Levels of LEVEL1_QRT

Individual confidence level = 98.92%

LEVEL1_QRT = 1 subtracted from:
LEVEL1_QRT  Lower  Center  Upper  -----+---------+---------+---------+----
2            6.42   14.79  23.16                  (---*----)
3           19.41   27.84  36.26                         (---*---)
4           27.83   36.42  45.00                             (---*---)
                                   -----+---------+---------+---------+----
                                      -20         0        20        40
LEVEL1_QRT = 2 subtracted from:
LEVEL1_QRT  Lower  Center  Upper  -----+---------+---------+---------+----
3            4.54   13.04  21.55                 (----*---)
4           12.96   21.62  30.28                     (----*---)
                                   -----+---------+---------+---------+----
                                      -20         0        20        40

LEVEL1_QRT = 3 subtracted from:
LEVEL1_QRT  Lower  Center   Upper  -----+---------+---------+---------+----
4           -0.14    8.58   17.30              (---*----)
                                    -----+---------+---------+---------+----
                                       -20         0        20        40
```

Figure 6. Boxplot and one-way ANOVA (with Tukey's comparison) of VIBI score versus total level 1 assessment scores by quartiles.




```
Source        DF      SS     MS      F      P
LEVEL1_QRT     3   63799  21266  50.50  0.000
Error        294  123819    421
Total        297  187618

S = 20.52   R-Sq = 34.00%   R-Sq(adj) = 33.33%

                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level   N   Mean  StDev  -------+---------+---------+---------+--
1      79  32.60  19.14  (---*---)
2      76  45.50  22.47            (---*---)
3      74  60.92  21.90                        (---*---)
4      69  71.02  18.13                                (---*---)
                         -------+---------+---------+---------+--
                               36        48        60        72

Pooled StDev = 20.52


Grouping Information Using Tukey Method

LEVEL1_QRT   N   Mean  Grouping
4           69  71.02  A
3           74  60.92    B
2           76  45.50      C
1           79  32.60        D
Means that do not share a letter are significantly different.

Tukey 95% Simultaneous Confidence Intervals
All Pairwise Comparisons among Levels of LEVEL1_QRT

Individual confidence level = 98.92%
LEVEL1_QRT = 1 subtracted from:
LEVEL1_QRT  Lower  Center  Upper  ----+---------+---------+---------+-----
2            4.43   12.90  21.36               (--*---)
3           19.80   28.32  36.84                     (--*---)
4           29.74   38.42  47.10                         (--*---)
                                  ----+---------+---------+---------+-----
                                    -25         0        25        50

LEVEL1_QRT = 2 subtracted from:
LEVEL1_QRT  Lower  Center  Upper  ----+---------+---------+---------+-----
3            6.82   15.42  24.03                (--*---)
4           16.77   25.53  34.28                    (--*---)
                                  ----+---------+---------+---------+-----
                                    -25         0        25        50
LEVEL1_QRT = 3 subtracted from:
LEVEL1_QRT  Lower  Center  Upper  ----+---------+---------+---------+-----
4            1.29   10.10  18.92              (--*---)
                                  ----+---------+---------+---------+-----
                                    -25         0        25        50
```

Figure 7. Boxplot and one-way ANOVA (with Tukey's comparison) of VIBI-FQ score versus total level 1 assessment scores by quartiles.




```
Source         DF     SS     MS      F      P
LEVEL1_QRT      3  32987  10996  57.42  0.000
Error         287  54955    191
Total         290  87942

S = 13.84   R-Sq = 37.51%   R-Sq(adj) = 36.86%

                         Individual 95% CIs For Mean Based on
                         Pooled StDev
Level   N   Mean  StDev   +---------+---------+---------+---------
1      75  43.13  15.40   (--*--)
2      75  56.14  15.17               (--*--)
3      74  66.01  13.49                         (--*--)
4      67  71.14  10.38                              (--*--)
                          +---------+---------+---------+---------
                         40        50        60        70
Pooled StDev = 13.84


Grouping Information Using Tukey Method
LEVEL1_QRT   N   Mean  Grouping
4           67  71.14  A
3           74  66.01  A
2           75  56.14    B
1           75  43.13      C
Means that do not share a letter are significantly different.

Tukey 95% Simultaneous Confidence Intervals
All Pairwise Comparisons among Levels of LEVEL1_QRT

Individual confidence level = 98.92%
LEVEL1_QRT = 1 subtracted from:
LEVEL1_QRT  Lower  Center  Upper  ----+---------+---------+---------+-----
2            7.21   13.01  18.81                     (---*---)
3           17.05   22.87  28.69                           (---*---)
4           22.04   28.01  33.98                               (---*---)
                                  ----+---------+---------+---------+-----
                                    -15         0        15        30
LEVEL1_QRT = 2 subtracted from:
LEVEL1_QRT  Lower  Center  Upper  ----+---------+---------+---------+-----
3            4.05    9.87  15.69                   (---*--)
4            9.03   15.00  20.97                      (---*---)
                                  ----+---------+---------+---------+-----
                                    -15         0        15        30
LEVEL1_QRT = 3 subtracted from:
LEVEL1_QRT  Lower  Center  Upper  ----+---------+---------+---------+-----
4           -0.85    5.14  11.12               (---*---)
                                  ----+---------+---------+---------+-----
                                     -15        0         15        30
```

Figure 8. Boxplot and one-way ANOVA (with Tukey's comparison) of ORAM score versus total level 1 assessment scores by quartiles.

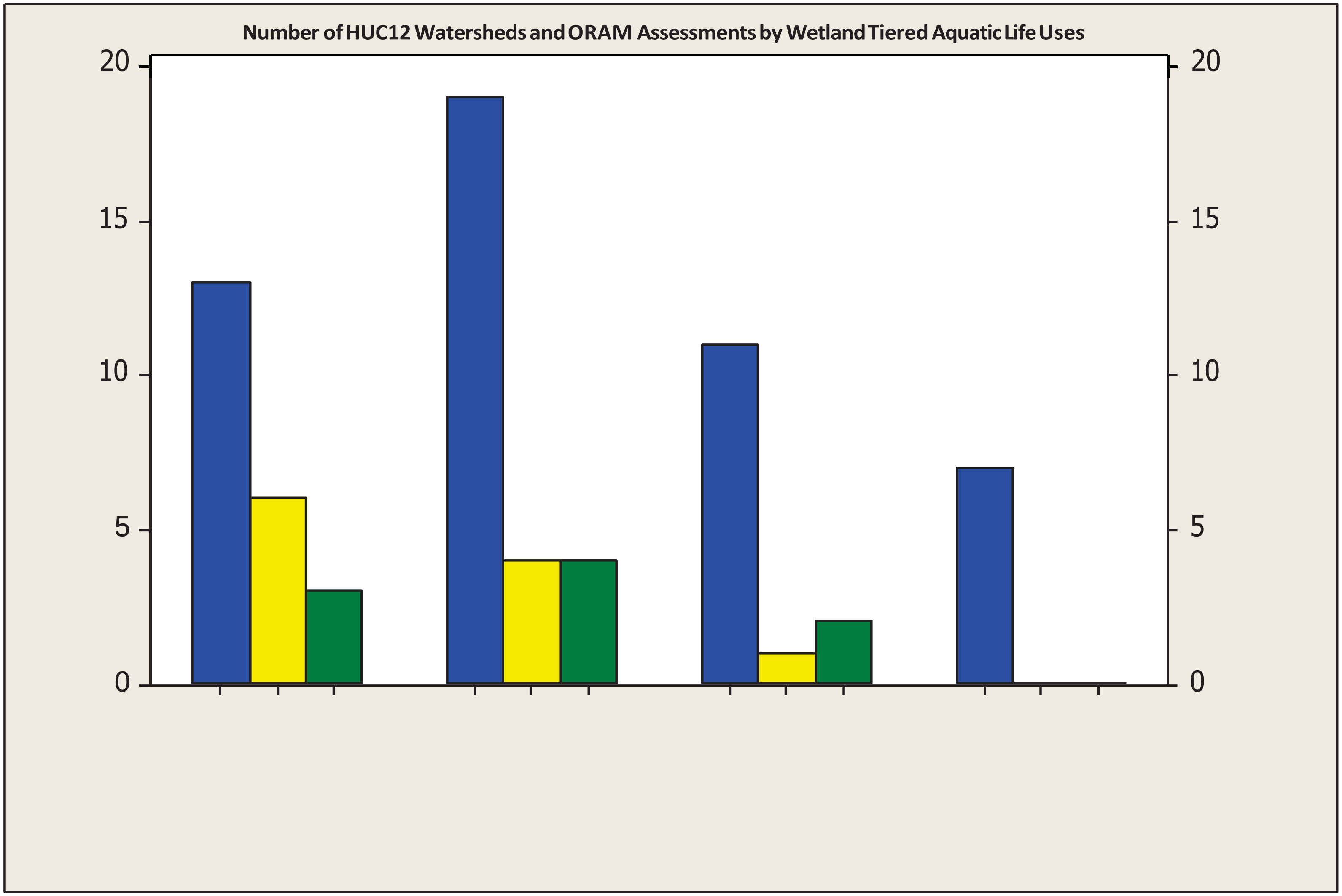


Figure 9. Bar graph displaying the number of HUC12 watersheds (level 1 and level 2 characterization) and the number of field ORAM assessments for the Middle Scioto TMDL study area falling into each of the proposed wetland tiered aquatic life use categories ("limited quality wetland habitat" [category 1, or "poor" condition], "restorable wetland habitat" [modified category 2, or "fair" condition],"wetland habitat" [category 2, or "good" condition], "superior wetland habitat" [category 3, or "excellent" condition].

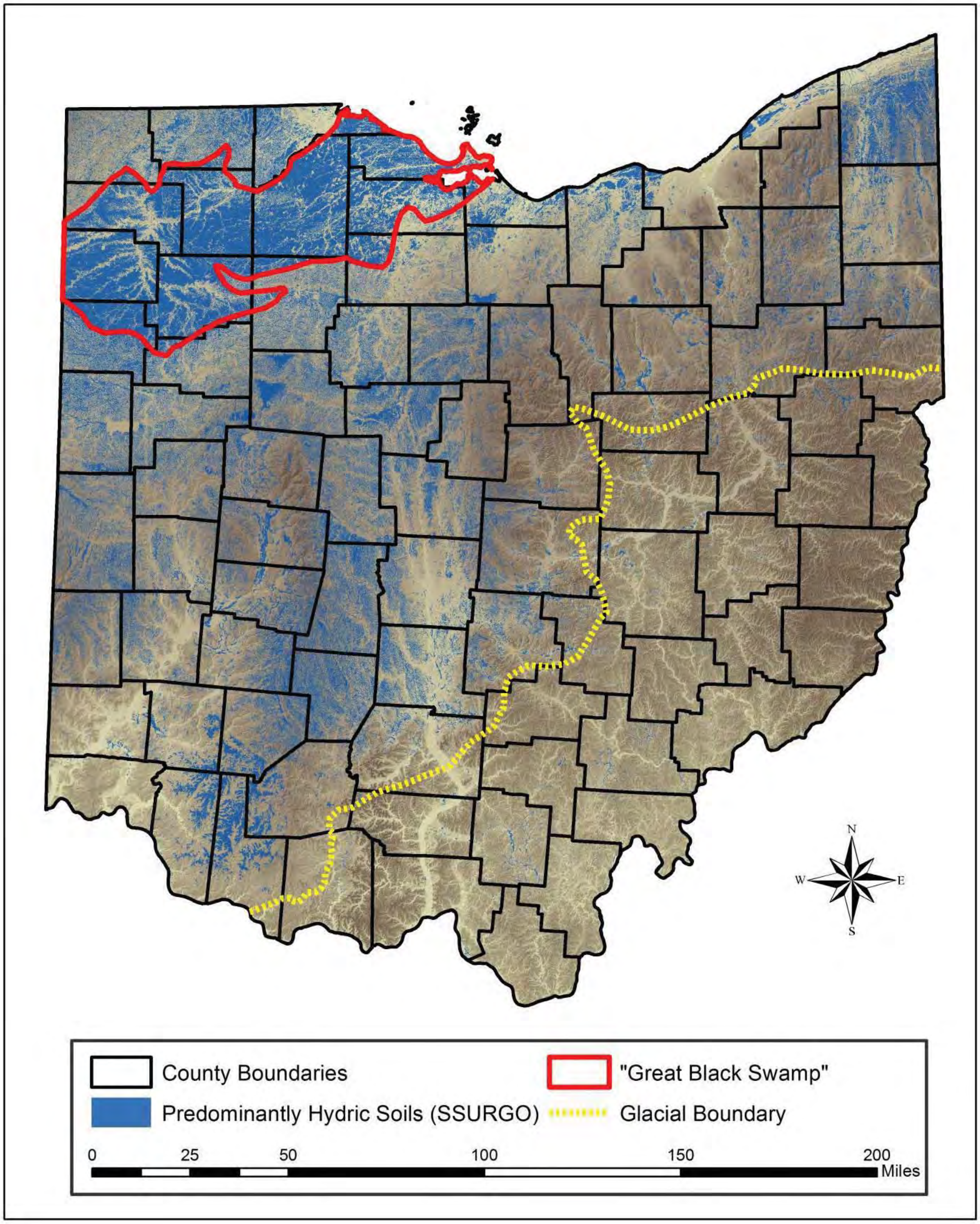


Figure 10. Approximate extent of pre-settlement wetlands in Ohio, based on SSURGO hydric soil mapping.

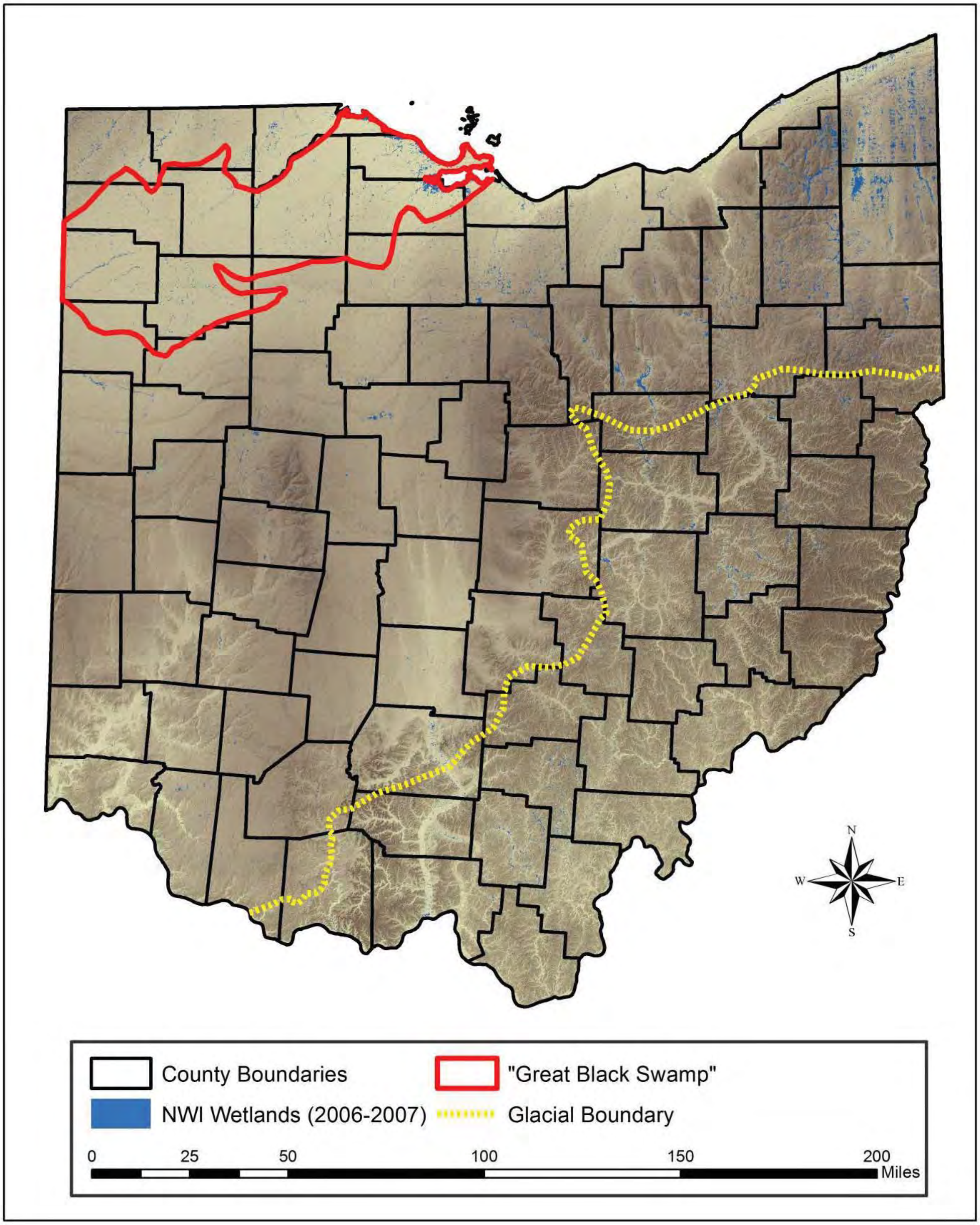
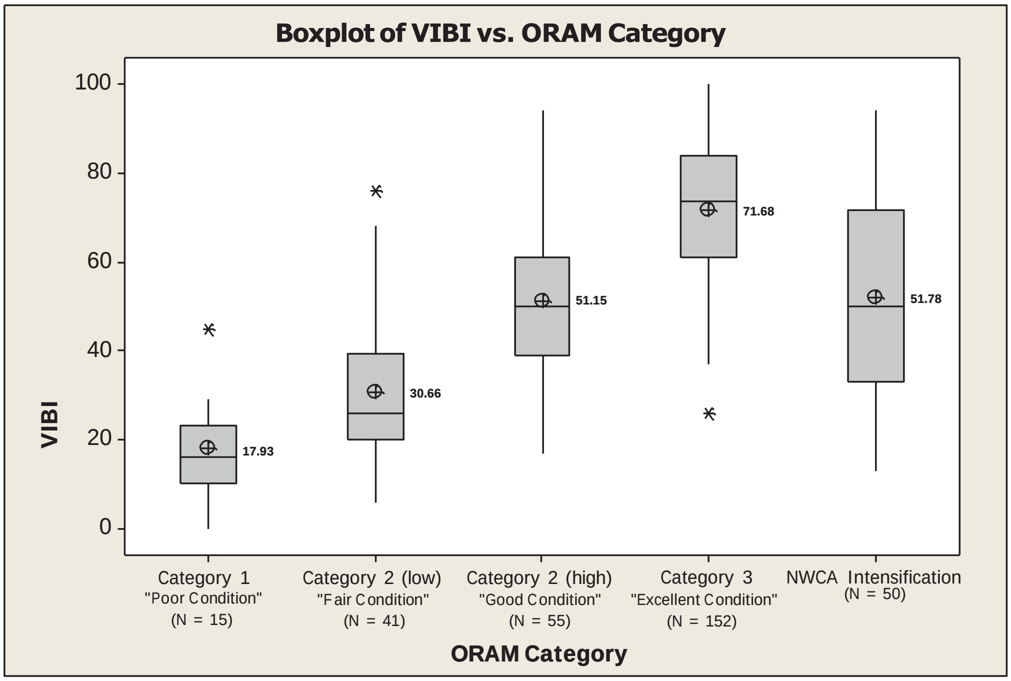


Figure 11. Extant wetland area in Ohio, based on National Wetland Inventory (NWI) mapping of emergent, scrub-shrub and forested wetlands.

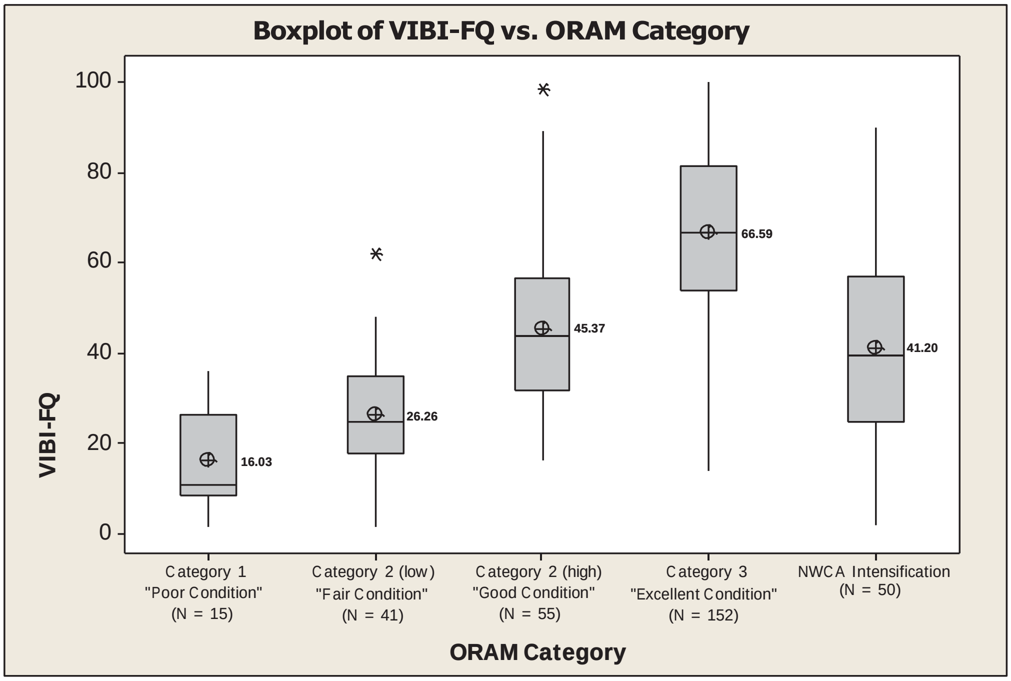


One-way ANOVA: VIBI versus GROUP2

```
Source    DF      SS     MS      F      P
GROUP2     4   87364  21841  70.22  0.000
Error    308   95802    311
Total    312  183166

S = 17.64   R-Sq = 47.70%   R-Sq(adj) = 47.02%

Level                   N   Mean  StDev
Category 1             15  17.93  11.60
Category 2A            41  30.66  15.51
Category 2B            55  51.15  18.13
Category 3            152  71.68  16.13
NWCA                   50  51.78  23.59

                      Individual 95% CIs For Mean Based on
                      Pooled StDev
Level                 ------+---------+---------+---------+---
Category 1            (----*---)
Category 2A                    (-*--)
Category 2B                              (--*-)
Category 3                                          (-*)
NWCA                                     (--*-)
                      ------+---------+---------+---------+---
                           20        40        60        80
Pooled StDev = 17.64

Grouping Information Using Tukey Method
GROUP2                  N   Mean  Grouping
Category 3            152  71.68  A
NWCA                   50  51.78    B
Category 2B            55  51.15    B
Category 2A            41  30.66      C
Category 1             15  17.93      C
```

Means that do not share a letter are significantly different.

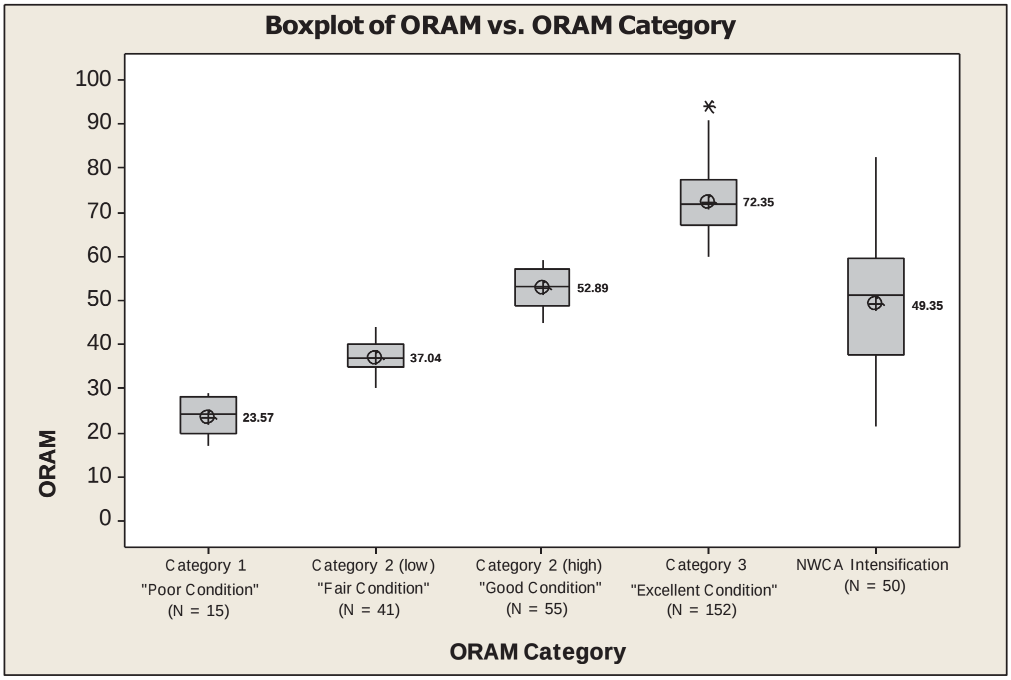
Figure 12. Box and whiskers plot and Minitab output of VIBI scores for 50 Ohio intensification study wetlands compared with VIBI scores for Ohio EPA natural reference wetland dataset, broken down by ORAM categories.



One-way ANOVA: VIBI-FQ versus GROUP2

```
Source    DF      SS     MS      F      P
GROUP2     4   86948  21737  64.81  0.000
Error    308  103303    335
Total    312  190251

S = 18.31   R-Sq = 45.70%   R-Sq(adj) = 45.00%

Level                   N   Mean  StDev
Category 1             15  16.03  10.87
Category 2A            41  26.26  12.64
Category 2B            55  45.37  18.75
Category 3            152  66.59  19.41
NWCA                   50  41.20  19.88

                      Individual 95% CIs For Mean Based on
                      Pooled StDev
Level                 ------+---------+---------+---------+---
Category 1            (-----*-----)
Category 2A                    (--*---)
Category 2B                                (--*--)
Category 3                                                (-*)
NWCA                                     (--*--)
                      ------+---------+---------+---------+---
                           16        32        48        64
Pooled StDev = 18.31

Grouping Information Using Tukey Method
GROUP2                  N   Mean  Grouping
Category 3            152  66.59  A
Category 2B            55  45.37    B
NWCA                   50  41.20    B
Category 2A            41  26.26      C
Category 1             15  16.03      C

Means that do not share a letter are significantly different.
```

Figure 13. Box and whiskers plot and Minitab output of VIBI-FQ scores for 50 Ohio intensification study wetlands compared with VIBI-FQ scores for Ohio EPA natural reference wetland dataset, broken down by ORAM categories.



One-way ANOVA: ORAM versus GROUP2

```
Source   DF       SS       MS       F      P
GROUP2    4  72233.3  18058.3  258.68  0.000
Error   308  21501.2     69.8
Total   312  93734.5

S = 8.355   R-Sq = 77.06%   R-Sq(adj) = 76.76%

Level                  N    Mean   StDev
Category 1            15  23.567   4.161
Category 2A           41  37.037   3.898
Category 2B           55  52.891   4.316
Category 3           152  72.345   7.302
NWCA                  50  49.350  15.382

                      Individual 95% CIs For Mean Based on
                      Pooled StDev
Level                 -------+---------+---------+---------+--
Category 1            (--*--)
Category 2A                     (-*)
Category 2B                                (*-)
Category 3                                              (*)
NWCA                                (-*)
                      -------+---------+---------+---------+--
                            30        45        60        75
Pooled StDev = 8.355

Grouping Information Using Tukey Method
GROUP2                 N    Mean  Grouping
Category 3           152  72.345  A
Category 2B           55  52.891    B
NWCA                  50  49.350    B
Category 2A           41  37.037      C
Category 1            15  23.567        D

Means that do not share a letter are significantly different.
```

Figure 14. Box and whiskers plot and Minitab output of ORAM scores for 50 Ohio intensification study wetlands compared with ORAM scores for Ohio EPA natural reference wetland dataset, broken down by ORAM categories.

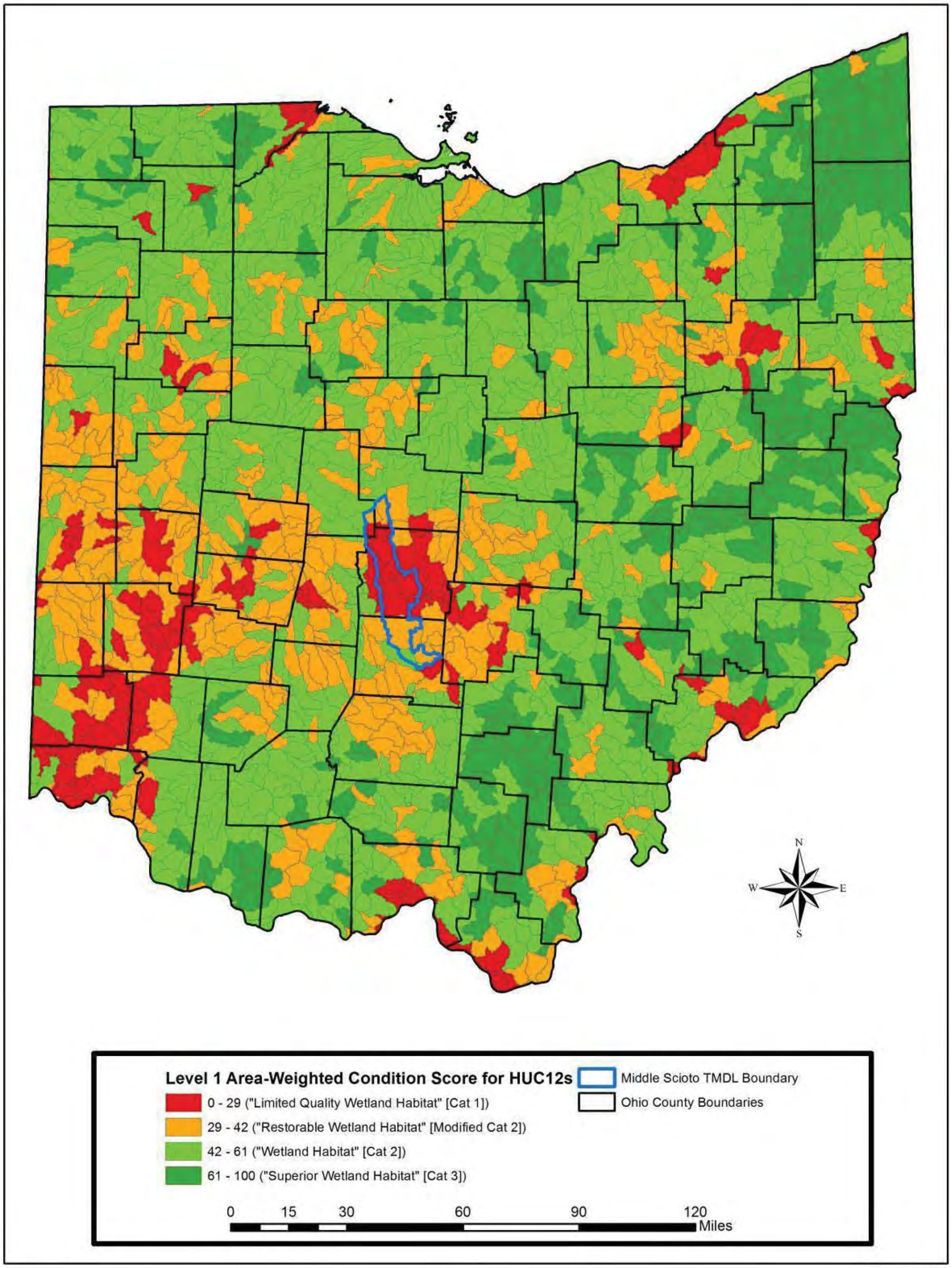


Figure 15. All HUC 12 watersheds in Ohio symbolized by area-weighted Level 1 wetland condition score for all NWI wetlands occurring within each watershed.

Table 4. ORAM, VIBI, and VIBI-FQ scores for all Ohio NWCA intensification wetlands, broken down by approximate ecological condition ranges. For Ohio assessments, these ranges correspond to Ohio's wetland anti-degradation categories (Category 1 = "Poor," Low Category 2 = "Fair," High Category 2 = "Good," and Category 3 = "Excellent).

Wetland Condition	ORAM	VIBI	VIBI-FQ
"Poor"	7 (14%)	11 (22%)	8 (16%)
"Fair"	15 (30%)	14 (28%)	16 (32%)
"Good"	17 (34%)	7 (14%)	16 (32%)
"Excellent"	11 (22%)	18 (36%)	8 (16%)

Table 5. Ohio's HUC 12 watersheds with wetland assessment information

HUC12	HUC12 Name	Historic Wetland %	Curent Wetland %	Wetland Loss %	Number of NWI Wetlands	Area-Weighted Level 1 Score	Number of ORAM Assessments	Mean ORAM Score	Number of VIBI Assessments	Mean VIBI Score	Number of VIBI-FQ Assessments	Mean VIBI-FQ Score
041000010301	Shantee Creek	20.67	0.08	99.59	3	20.27	0	0.00	0	0.00	0	0.00
041000010302	Halfway Creek	26.83	1.29	95.18	6	13.93	0	0.00	0	0.00	0	0.00
041000010303	Prairie Ditch	64.66	5.66	91.24	74	72.32	2	78.50	1	93.00	1	100.00
041000010304	Headwaters Tenmile Creek	61.77	1.02	98.35	61	48.81	0	0.00	0	0.00	0	0.00
041000010305	North Tenmile Creek	31.15	1.13	96.37	4	22.08	0	0.00	0	0.00	0	0.00
041000010306	Tenmile Creek	36.67	1.88	94.87	18	46.64	0	0.00	0	0.00	0	0.00
041000010307	Heldman Ditch-Ottawa River	29.25	2.26	92.28	68	55.06	4	62.75	4	65.75	4	66.75
041000010308	Sibley Creek-Ottawa River	15.54	1.00	93.58	22	25.74	0	0.00	0	0.00	0	0.00
041000010309	Detwiler Ditch-Frontal Lake Erie	15.78	3.56	77.46	22	18.90	0	0.00	0	0.00	0	0.00
041000020301	Headwaters Bear Creek	42.58	2.61	93.87	111	49.14	0	0.00	0	0.00	0	0.00
041000020303	Nile Ditch	40.28	1.45	96.40	6	50.19	0	0.00	0	0.00	0	0.00
041000020304	Little Bear Creek-Bear Creek	56.72	0.47	99.17	16	35.87	0	0.00	0	0.00	0	0.00
041000030104	Bird Creek-East Branch Saint Joseph River	19.33	8.00	58.59	7	59.77	0	0.00	0	0.00	0	0.00
041000030106	Clear Fork-East Branch Saint Joseph River	28.48	4.08	85.66	174	51.84	1	79.00	1	100.00	1	97.22
041000030204	Lake Da Su An-West Branch Saint Joseph River	19.17	5.90	69.25	180	61.70	0	0.00	0	0.00	0	0.00
041000030301	Nettle Creek	28.83	3.76	86.95	174	57.50	0	0.00	0	0.00	0	0.00
041000030302	Cogsworth Cemetary-Saint Joseph River	30.08	8.04	73.28	68	59.71	0	0.00	0	0.00	0	0.00
041000030303	Eagle Creek	27.70	4.24	84.68	283	55.75	0	0.00	0	0.00	0	0.00
041000030304	Village of Montpelier-Saint Joseph River	24.32	7.61	68.68	126	55.67	0	0.00	0	0.00	0	0.00
041000030305	Bear Creek	27.27	2.36	91.36	125	52.73	0	0.00	0	0.00	0	0.00
041000030306	West Buffalo Cemetary-Saint Joseph River	22.55	4.91	78.24	83	61.59	0	0.00	0	0.00	0	0.00
041000030402	Headwaters Fish Creek	29.54	5.76	80.51	133	56.93	2	91.00	2	84.00	2	93.33
041000030405	Town of Alvarado-Fish Creek	24.35	7.54	69.05	68	60.63	0	0.00	0	0.00	0	0.00
041000030406	Cornell Ditch-Fish Creek	24.19	6.43	73.42	105	49.72	0	0.00	0	0.00	0	0.00
041000030501	Bluff Run-Saint Joseph River	26.70	4.28	83.97	154	49.06	0	0.00	0	0.00	0	0.00
041000030502	Big Run	26.63	5.56	79.13	33	32.17	0	0.00	0	0.00	0	0.00
041000030503	Russell Run-Saint Joseph River	26.57	4.53	82.93	184	44.95	0	0.00	0	0.00	0	0.00
041000030505	Willow Run-Saint Joseph River	26.12	5.40	79.33	163	46.98	0	0.00	0	0.00	0	0.00
041000030506	Hoodelmier Ditch-Saint Joseph River	22.94	2.37	89.68	14	42.92	0	0.00	0	0.00	0	0.00
041000040101	Muddy Creek	31.94	0.61	98.08	128	38.78	0	0.00	0	0.00	0	0.00
041000040102	Center Branch	31.80	0.49	98.46	159	44.77	0	0.00	0	0.00	0	0.00
041000040103	East Branch	29.91	0.32	98.92	73	53.86	0	0.00	0	0.00	0	0.00
041000040104	Kopp Creek	34.58	0.26	99.24	96	41.98	0	0.00	0	0.00	0	0.00
041000040105	Sixmile Creek	28.88	0.25	99.13	46	41.67	0	0.00	0	0.00	0	0.00
041000040106	Fourmile Creek-Saint Marys River	18.08	2.76	84.73	148	42.85	0	0.00	0	0.00	0	0.00
041000040201	Hussey Creek	37.11	0.39	98.94	35	47.52	0	0.00	0	0.00	0	0.00
041000040202	Eightmile Creek	44.88	0.11	99.75	38	43.70	0	0.00	0	0.00	0	0.00

HUC12	HUC12 Name	Historic Wetland %	Curent Wetland %	Wetland Loss %	Number of NWI Wetlands	Area-Weighted Level 1 Score	Number of ORAM Assessments	Mean ORAM Score	Number of VIBI Assessments	Mean VIBI Score	Number of VIBI-FQ Assessments	Mean VIBI-FQ Score
041000040203	Blierdofer Ditch	45.35	0.29	99.35	42	38.81	0	0.00	0	0.00	0	0.00
041000040204	Twelvemile Creek	43.71	0.44	99.00	52	52.62	0	0.00	0	0.00	0	0.00
041000040205	Prairie Creek-Saint Marys River	34.64	3.06	91.18	248	50.89	0	0.00	0	0.00	0	0.00
041000040301	Little Black Creek	60.11	0.48	99.20	62	31.40	0	0.00	0	0.00	0	0.00
041000040302	Black Creek	52.99	0.67	98.74	55	36.28	0	0.00	0	0.00	0	0.00
041000040303	Yankee Run-Saint Marys River	48.03	4.37	90.89	434	52.09	1	77.00	1	64.00	1	59.75
041000040304	Duck Creek	60.15	0.86	98.58	30	41.56	0	0.00	0	0.00	0	0.00
041000040305	Town of Willshire-Saint Marys River	41.27	1.65	96.00	32	37.40	0	0.00	0	0.00	0	0.00
041000040401	Twentyseven Mile Creek	47.54	0.71	98.51	112	52.78	0	0.00	0	0.00	0	0.00
041000040404	Little Blue Creek	60.95	0.39	99.37	2	60.21	0	0.00	0	0.00	0	0.00
041000050201	Zuber Cutoff	81.97	0.39	99.52	14	29.81	0	0.00	0	0.00	0	0.00
041000050202	North Chaney Ditch-Maumee River	48.74	0.91	98.14	18	40.41	0	0.00	0	0.00	0	0.00
041000050203	Marie DeLarme Creek	59.24	3.25	94.51	77	49.11	2	74.50	1	67.00	1	66.50
041000050204	Gordon Creek	49.23	0.95	98.07	76	50.87	0	0.00	0	0.00	0	0.00
041000050205	Sixmile Cutoff-Maumee River	46.03	1.15	97.50	17	43.93	0	0.00	0	0.00	0	0.00
041000050206	Platter Creek	59.74	0.98	98.36	21	56.29	0	0.00	0	0.00	0	0.00
041000050207	Sulphur Creek-Maumee River	63.84	1.16	98.18	27	52.57	0	0.00	0	0.00	0	0.00
041000050208	Snooks Run-Maumee River	46.19	1.14	97.53	35	57.66	0	0.00	0	0.00	0	0.00
041000060201	Silver Creek-Bean Creek	35.30	3.15	91.09	23	45.33	0	0.00	0	0.00	0	0.00
041000060202	Deer Creek-Bean Creek	33.09	2.79	91.57	41	53.28	0	0.00	0	0.00	0	0.00
041000060203	Old Bean Creek	44.01	2.86	93.50	112	55.03	0	0.00	0	0.00	0	0.00
041000060204	Mill Creek	24.72	3.50	85.85	207	54.09	0	0.00	0	0.00	0	0.00
041000060205	Stag Run-Bean Creek	36.79	1.81	95.07	29	51.88	0	0.00	0	0.00	0	0.00
041000060301	Bates Creek-Tiffin River	33.94	3.83	88.71	72	53.13	0	0.00	0	0.00	0	0.00
041000060302	Leatherwood Creek	31.75	2.18	93.13	32	47.31	0	0.00	0	0.00	0	0.00
041000060303	Flat Run-Tiffin River	37.05	2.56	93.10	41	63.01	0	0.00	0	0.00	0	0.00
041000060401	Upper Lick Creek	18.92	2.40	87.30	122	48.68	0	0.00	0	0.00	0	0.00
041000060402	Middle Lick Creek	45.86	2.14	95.34	67	56.41	0	0.00	0	0.00	0	0.00
041000060403	Prairie Creek	54.95	0.44	99.21	20	62.29	0	0.00	0	0.00	0	0.00
041000060404	Lower Lick Creek	57.10	1.49	97.39	25	59.31	0	0.00	0	0.00	0	0.00
041000060501	Beaver Creek	29.35	3.11	89.39	147	53.70	0	0.00	0	0.00	0	0.00
041000060502	Brush Creek	49.35	1.59	96.78	169	44.26	0	0.00	0	0.00	0	0.00
041000060503	Village of Stryker-Tiffin River	35.23	3.37	90.44	42	62.69	0	0.00	0	0.00	0	0.00
041000060504	Coon Creek-Tiffin River	56.67	1.69	97.01	51	61.77	0	0.00	0	0.00	0	0.00
041000060601	Lost Creek	45.46	1.68	96.31	73	59.75	0	0.00	0	0.00	0	0.00
041000060602	Mud Creek	52.87	1.25	97.64	48	61.02	0	0.00	0	0.00	0	0.00
041000060603	Webb Run	63.29	1.80	97.16	44	51.63	0	0.00	0	0.00	0	0.00
041000060604	Buckskin Creek-Tiffin River	43.37	1.16	97.32	45	51.29	0	0.00	0	0.00	0	0.00
041000070101	Headwaters Auglaize River	34.09	0.87	97.46	256	41.24	0	0.00	0	0.00	0	0.00

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041000070102	Blackhoof Creek	22.63	0.41	98.21	100	44.00	0	0.00	0	0.00	0	0.00
041000070103	Wrestle Creek-Auglaize River	28.36	0.88	96.91	199	48.08	0	0.00	0	0.00	0	0.00
041000070104	Pusheta Creek	27.86	0.37	98.68	157	41.80	0	0.00	0	0.00	0	0.00
041000070105	Dry Run-Auglaize River	21.55	0.30	98.60	82	35.01	0	0.00	0	0.00	0	0.00
041000070201	Twomile Creek	31.97	0.26	99.18	78	45.18	0	0.00	0	0.00	0	0.00
041000070202	Village of Buckland-Auglaize River	16.86	0.70	95.85	49	44.65	0	0.00	0	0.00	0	0.00
041000070203	Sims Run-Auglaize River	26.72	0.62	97.69	80	45.77	0	0.00	0	0.00	0	0.00
041000070204	Sixmile Creek-Auglaize River	43.57	1.95	95.52	172	45.26	0	0.00	0	0.00	0	0.00
041000070301	Upper Hog Creek	46.51	1.78	96.18	90	55.81	0	0.00	0	0.00	0	0.00
041000070302	Middle Hog Creek	55.52	0.79	98.58	68	53.79	0	0.00	0	0.00	0	0.00
041000070303	Little Hog Creek	24.54	0.70	97.14	95	40.33	0	0.00	0	0.00	0	0.00
041000070304	Lower Hog Creek	31.19	1.74	94.42	106	49.24	0	0.00	0	0.00	0	0.00
041000070305	Lost Creek	23.65	0.83	96.48	85	21.39	0	0.00	0	0.00	0	0.00
041000070306	Lima Reservoir-Ottawa River	14.35	1.03	92.80	175	31.68	0	0.00	0	0.00	0	0.00
041000070401	Little Ottawa River	22.65	0.67	97.05	97	26.50	0	0.00	0	0.00	0	0.00
041000070402	Dug Run-Ottawa River	42.37	0.97	97.71	42	56.86	0	0.00	0	0.00	0	0.00
041000070403	Honey Run	23.56	0.65	97.23	116	23.79	1	33.50	1	64.00	1	46.92
041000070404	Pike Run	38.15	0.41	98.93	45	32.01	0	0.00	0	0.00	0	0.00
041000070405	Leatherwood Ditch	65.22	0.71	98.91	19	50.46	0	0.00	0	0.00	0	0.00
041000070406	Beaver Run-Ottawa River	55.39	1.76	96.82	101	33.71	0	0.00	0	0.00	0	0.00
041000070501	Sugar Creek	42.85	0.90	97.90	216	45.85	0	0.00	0	0.00	0	0.00
041000070502	Plum Creek	65.49	0.51	99.22	47	37.79	0	0.00	0	0.00	0	0.00
041000070503	Village of Kalida-Ottawa River	77.51	1.45	98.12	40	34.81	0	0.00	0	0.00	0	0.00
041000070601	Kyle Prairie Creek	46.14	0.18	99.61	52	55.20	0	0.00	0	0.00	0	0.00
041000070602	Long Prairie Creek-Little Auglaize River	58.61	0.17	99.70	40	48.42	0	0.00	0	0.00	0	0.00
041000070603	Wolf Ditch-Little Auglaize River	60.37	0.24	99.60	39	51.53	0	0.00	0	0.00	0	0.00
041000070604	Dry Fork-Little Auglaize River	77.50	0.60	99.23	95	50.55	0	0.00	0	0.00	0	0.00
041000070701	Hagerman Creek	83.17	0.07	99.91	4	38.75	0	0.00	0	0.00	0	0.00
041000070702	West Branch Prairie Creek	70.54	0.39	99.45	94	47.20	0	0.00	0	0.00	0	0.00
041000070703	Prairie Creek	84.36	0.70	99.17	23	54.20	0	0.00	0	0.00	0	0.00
041000070801	Dog Creek	75.52	0.42	99.44	68	41.33	0	0.00	0	0.00	0	0.00
041000070802	Upper Town Creek	56.80	0.25	99.56	38	53.66	0	0.00	0	0.00	0	0.00
041000070803	Maddox Creek	64.74	0.22	99.67	73	50.00	0	0.00	0	0.00	0	0.00
041000070804	Lower Town Creek	74.20	0.18	99.75	44	55.68	0	0.00	0	0.00	0	0.00
041000070805	Middle Creek	77.52	0.97	98.75	22	55.99	0	0.00	0	0.00	0	0.00
041000070806	Burt Lake-Little Auglaize River	57.73	0.94	98.38	13	38.96	0	0.00	0	0.00	0	0.00
041000070901	Upper Jennings Creek	57.31	0.29	99.50	57	49.46	0	0.00	0	0.00	0	0.00
041000070902	West Jennings Creek	67.80	0.15	99.78	10	36.42	0	0.00	0	0.00	0	0.00
041000070903	Lower Jennings Creek	61.96	0.77	98.76	57	37.92	0	0.00	0	0.00	0	0.00

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041000070904	Big Run-Auglaize River	71.71	2.77	96.14	53	53.91	0	0.00	0	0.00	0	0.00
041000070905	Lapp Ditch-Auglaize River	77.37	2.94	96.20	49	49.09	0	0.00	0	0.00	0	0.00
041000070906	Prairie Creek	77.02	1.77	97.70	25	50.47	0	0.00	0	0.00	0	0.00
041000070907	Town of Oakwood-Auglaize River	55.29	2.04	96.31	23	60.08	1	78.00	1	87.00	1	91.63
041000071001	Upper Prairie Creek	81.71	0.01	99.99	3	38.71	0	0.00	0	0.00	0	0.00
041000071002	Upper Blue Creek	66.31	0.20	99.70	19	48.20	0	0.00	0	0.00	0	0.00
041000071003	Middle Blue Creek	85.42	0.54	99.36	11	47.20	0	0.00	0	0.00	0	0.00
041000071004	Lower Blue Creek	80.19	1.74	97.83	75	53.42	0	0.00	0	0.00	0	0.00
041000071005	Town of Charloe-Auglaize River	59.71	1.07	98.21	30	57.68	0	0.00	0	0.00	0	0.00
041000071101	North Powell Creek	74.82	2.46	96.71	106	54.76	0	0.00	0	0.00	0	0.00
041000071102	Upper Powell Creek	72.42	2.06	97.16	84	49.15	0	0.00	0	0.00	0	0.00
041000071103	Lower Powell Creek	46.30	1.07	97.69	24	48.13	0	0.00	0	0.00	0	0.00
041000071201	Headwaters Flatrock Creek	50.12	0.13	99.73	6	35.28	0	0.00	0	0.00	0	0.00
041000071204	Brown Ditch-Flatrock Creek	53.00	1.54	97.10	1	34.00	0	0.00	0	0.00	0	0.00
041000071205	Wildcat Creek-Flatrock Creek	75.02	2.68	96.43	39	64.98	0	0.00	0	0.00	0	0.00
041000071206	Big Run-Flatrock Creek	69.24	3.88	94.39	74	52.46	0	0.00	0	0.00	0	0.00
041000071207	Little Flatrock Creek	81.70	0.56	99.32	12	45.41	0	0.00	0	0.00	0	0.00
041000071208	Sixmile Creek	65.44	1.31	97.99	35	67.17	0	0.00	0	0.00	0	0.00
041000071209	Eagle Creek-Auglaize River	50.95	1.08	97.88	53	57.74	0	0.00	0	0.00	0	0.00
041000080101	Cessna Creek	35.07	1.83	94.79	102	52.68	1	61.00	1	53.00	0	0.00
041000080102	Headwaters Blanchard River	41.27	0.53	98.70	47	43.69	0	0.00	0	0.00	0	0.00
041000080103	The Outlet-Blanchard River	37.78	2.68	92.91	159	46.25	0	0.00	0	0.00	0	0.00
041000080104	Potato Run	36.41	0.56	98.46	110	39.24	0	0.00	0	0.00	0	0.00
041000080105	Ripley Run-Blanchard River	30.61	1.06	96.54	193	49.85	1	48.00	1	17.00	0	0.00
041000080201	Brights Ditch	46.80	0.31	99.35	51	40.76	0	0.00	0	0.00	0	0.00
041000080202	The Outlet	38.47	1.30	96.63	28	52.49	1	51.00	1	74.00	1	72.20
041000080203	Findlay Upground Reservoir Number One-Blanchard River	42.93	0.91	97.88	110	51.04	0	0.00	0	0.00	0	0.00
041000080204	Lye Creek	43.45	0.89	97.96	69	53.17	0	0.00	0	0.00	0	0.00
041000080205	City of Findlay-Blanchard River	30.63	1.03	96.63	11	39.42	0	0.00	0	0.00	0	0.00
041000080301	Upper Eagle Creek	34.54	0.87	97.49	63	60.18	0	0.00	0	0.00	0	0.00
041000080302	Lower Eagle Creek	40.22	0.98	97.57	105	34.02	0	0.00	0	0.00	0	0.00
041000080303	Aurand Run	43.87	1.19	97.29	52	42.71	0	0.00	0	0.00	0	0.00
041000080304	Howard Run-Blanchard River	32.31	1.07	96.70	65	37.94	0	0.00	0	0.00	0	0.00
041000080401	Binkley Ditch-Little Riley Creek	27.28	0.45	98.33	31	51.41	0	0.00	0	0.00	0	0.00
041000080402	Upper Riley Creek	35.41	0.45	98.72	45	59.26	0	0.00	0	0.00	0	0.00
041000080403	Marsh Run-Little Riley Creek	31.67	0.65	97.95	68	47.50	0	0.00	0	0.00	0	0.00
041000080404	Middle Riley Creek	33.27	0.36	98.91	52	47.25	0	0.00	0	0.00	0	0.00
041000080405	Lower Riley Creek	49.63	1.23	97.52	100	39.41	0	0.00	0	0.00	0	0.00
041000080501	Tiderishi Creek	38.83	0.48	98.77	52	58.96	0	0.00	0	0.00	0	0.00

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041000080502	Ottawa Creek	37.48	0.73	98.05	141	55.19	0	0.00	0	0.00	0	0.00
041000080503	Moffitt Ditch	51.53	0.48	99.06	12	58.61	0	0.00	0	0.00	0	0.00
041000080504	Dukes Run	46.76	1.20	97.43	32	50.45	0	0.00	0	0.00	0	0.00
041000080505	Dutch Run	60.61	1.19	98.03	29	53.65	0	0.00	0	0.00	0	0.00
041000080506	Village of Gilboa-Blanchard River	48.23	1.35	97.20	58	53.54	0	0.00	0	0.00	0	0.00
041000080601	Cranberry Creek	54.57	0.39	99.28	68	45.34	0	0.00	0	0.00	0	0.00
041000080602	Pike Run-Blanchard River	52.87	2.08	96.06	61	33.13	0	0.00	0	0.00	0	0.00
041000080603	Miller City Cutoff	80.02	1.60	98.00	28	41.84	0	0.00	0	0.00	0	0.00
041000080604	Bear Creek	71.62	1.20	98.33	16	46.91	0	0.00	0	0.00	0	0.00
041000080605	Deer Creek-Blanchard River	63.64	3.04	95.22	87	52.31	0	0.00	0	0.00	0	0.00
041000090101	West Creek	81.25	0.27	99.67	5	47.00	0	0.00	0	0.00	0	0.00
041000090102	Upper South Turkeyfoot Creek	80.23	0.71	99.12	20	54.70	0	0.00	0	0.00	0	0.00
041000090103	School Creek	79.53	2.00	97.48	49	59.00	0	0.00	0	0.00	0	0.00
041000090104	Middle South Turkeyfoot Creek	83.87	0.50	99.40	13	51.84	0	0.00	0	0.00	0	0.00
041000090105	Little Turkeyfoot Creek	84.16	0.51	99.40	9	61.15	0	0.00	0	0.00	0	0.00
041000090106	Lower South Turkeyfoot Creek	54.15	3.22	94.06	18	64.88	0	0.00	0	0.00	0	0.00
041000090201	Preston Run-Maumee River	45.19	0.55	98.78	16	20.98	0	0.00	0	0.00	0	0.00
041000090202	Benien Creek	71.10	0.68	99.04	19	52.21	0	0.00	0	0.00	0	0.00
041000090203	Wade Creek-Maumee River	56.75	1.27	97.76	41	56.03	0	0.00	0	0.00	0	0.00
041000090204	Garret Creek	67.90	1.33	98.04	35	54.95	0	0.00	0	0.00	0	0.00
041000090205	Oberhaus Creek	64.84	0.84	98.71	23	46.62	0	0.00	0	0.00	0	0.00
041000090206	Village of Napoleon-Maumee River	68.23	1.00	98.54	23	55.01	0	0.00	0	0.00	0	0.00
041000090207	Creager Cemetery-Maumee River	51.72	0.19	99.64	8	23.34	0	0.00	0	0.00	0	0.00
041000090301	Upper Bad Creek	50.80	3.31	93.48	210	51.66	0	0.00	0	0.00	0	0.00
041000090302	Lower Bad Creek	45.06	2.01	95.54	169	47.08	0	0.00	0	0.00	0	0.00
041000090401	Konzen Ditch	61.89	0.95	98.46	26	57.47	0	0.00	0	0.00	0	0.00
041000090402	North Turkeyfoot Creek	51.26	0.87	98.31	68	52.81	0	0.00	0	0.00	0	0.00
041000090403	Dry Creek-Maumee River	56.92	1.55	97.27	40	58.11	0	0.00	0	0.00	0	0.00
041000090501	Big Creek	81.12	0.76	99.07	16	59.68	0	0.00	0	0.00	0	0.00
041000090502	Hammer Creek	87.47	0.05	99.95	2	54.92	0	0.00	0	0.00	0	0.00
041000090503	Upper Beaver Creek	84.15	0.86	98.98	7	60.92	0	0.00	0	0.00	0	0.00
041000090504	Upper Yellow Creek	67.83	0.68	99.00	36	42.58	0	0.00	0	0.00	0	0.00
041000090505	Brush Creek	82.91	0.84	98.98	15	58.96	0	0.00	0	0.00	0	0.00
041000090506	Lower Yellow Creek	68.69	1.44	97.90	17	56.93	0	0.00	0	0.00	0	0.00
041000090507	Cutoff Ditch	79.47	0.17	99.78	7	35.49	0	0.00	0	0.00	0	0.00
041000090508	Middle Beaver Creek	81.50	1.48	98.18	19	57.85	0	0.00	0	0.00	0	0.00
041000090509	Lower Beaver Creek	53.01	3.76	92.91	22	63.31	0	0.00	0	0.00	0	0.00
041000090510	Lick Creek-Maumee River	49.76	1.99	96.00	42	49.91	0	0.00	0	0.00	0	0.00
041000090601	Tontogany Creek	66.51	0.60	99.10	23	58.99	0	0.00	0	0.00	0	0.00

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041000090602	Sugar Creek-Maumee River	43.69	1.32	96.97	41	48.04	0	0.00	0	0.00	0	0.00
041000090603	Haskins Road Ditch-Maumee River	68.80	0.94	98.64	11	51.90	0	0.00	0	0.00	0	0.00
041000090701	Ai Creek	55.59	2.72	95.11	127	72.93	5	66.10	3	80.67	3	83.09
041000090702	Fewless Creek-Swan Creek	48.97	2.09	95.73	121	51.33	0	0.00	0	0.00	0	0.00
041000090703	Gale Run-Swan Creek	35.01	3.31	90.55	87	72.32	7	61.86	3	83.67	2	71.43
041000090801	Upper Blue Creek	43.81	5.46	87.55	182	64.02	3	56.33	0	0.00	0	0.00
041000090802	Lower Blue Creek	51.66	1.77	96.58	67	57.04	4	65.63	3	78.00	3	73.31
041000090803	Wolf Creek	40.95	3.34	91.85	119	64.82	2	57.00	1	87.00	1	90.85
041000090804	Heilman Ditch-Swan Creek	46.72	1.74	96.27	61	48.86	2	63.00	2	50.00	2	62.81
041000090901	Grassy Creek Diversion	82.45	0.61	99.26	9	47.63	0	0.00	0	0.00	0	0.00
041000090902	Grassy Creek	62.45	0.64	98.97	12	35.96	0	0.00	0	0.00	0	0.00
041000090903	Crooked Creek-Maumee River	32.01	3.27	89.79	36	28.46	0	0.00	0	0.00	0	0.00
041000090904	Delaware Creek-Maumee River	15.35	1.22	92.07	25	18.76	0	0.00	0	0.00	0	0.00
041000100101	Rader Creek	72.00	1.17	98.37	44	55.72	0	0.00	0	0.00	0	0.00
041000100102	Needles Creek	80.69	0.68	99.15	18	53.62	0	0.00	0	0.00	0	0.00
041000100103	Rocky Ford	50.54	1.49	97.05	125	54.53	0	0.00	0	0.00	0	0.00
041000100104	Town of Rudolph-Middle Branch Portage River	79.16	1.35	98.30	29	60.08	0	0.00	0	0.00	0	0.00
041000100201	Bull Creek	69.90	1.70	97.57	32	52.17	0	0.00	0	0.00	0	0.00
041000100202	East Branch Portage River	50.40	1.43	97.16	30	59.99	0	0.00	0	0.00	0	0.00
041000100203	Town of Bloomdale-South Branch Portage River	54.90	1.13	97.94	44	65.85	0	0.00	0	0.00	0	0.00
041000100204	Rhodes Ditch-South Branch Portage River	62.93	2.78	95.59	24	60.93	0	0.00	0	0.00	0	0.00
041000100205	Cessna Ditch-Middle Branch Portage River	72.07	1.71	97.63	27	58.40	0	0.00	0	0.00	0	0.00
041000100301	North Branch Portage River	71.22	0.94	98.68	67	56.92	3	64.33	0	0.00	0	0.00
041000100302	Town of Pemberville-Portage River	65.32	0.51	99.22	11	42.80	0	0.00	0	0.00	0	0.00
041000100401	Sugar Creek	60.07	1.76	97.07	70	60.24	0	0.00	0	0.00	0	0.00
041000100402	Lacarpe Creek-Portage River	55.87	1.29	97.69	26	57.23	0	0.00	0	0.00	0	0.00
041000100501	Little Portage River	71.42	4.75	93.35	98	53.56	0	0.00	0	0.00	0	0.00
041000100502	Portage River	60.89	4.41	92.76	237	41.15	0	0.00	0	0.00	0	0.00
041000100503	Lacarpe Creek-Frontal Lake Erie	32.67	12.13	62.86	265	42.56	4	72.25	4	63.50	4	35.22
041000100601	Upper Toussaint Creek	70.99	1.06	98.50	72	48.08	0	0.00	0	0.00	0	0.00
041000100602	Packer Creek	74.77	1.66	97.78	80	44.75	0	0.00	0	0.00	0	0.00
041000100603	Lower Toussaint Creek	66.32	11.65	82.44	331	44.36	1	29.00	1	22.00	1	18.88
041000100701	Turtle Creek-Frontal Lake Erie	71.12	12.76	82.06	187	48.25	1	52.50	1	68.00	1	55.15
041000100702	Crane Creek-Frontal Lake Erie	77.32	6.41	91.71	134	50.65	1	51.00	0	0.00	0	0.00
041000100703	Cedar Creek-Frontal Lake Erie	74.53	1.59	97.86	56	48.02	0	0.00	0	0.00	0	0.00
041000100704	Wolf Creek-Frontal Lake Erie	70.99	25.20	64.51	49	52.36	4	59.00	4	44.00	4	44.03
041000100705	Berger Ditch	83.58	0.93	98.88	22	42.98	0	0.00	0	0.00	0	0.00
041000100706	Otter Creek-Frontal Lake Erie	52.74	2.79	94.72	30	30.18	0	0.00	0	0.00	0	0.00
041000110101	Sawmill Creek	47.71	0.69	98.55	19	47.18	1	66.00	0	0.00	0	0.00

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041000110102	Pipe Creek-Frontal Sandusky Bay	38.90	2.35	93.96	91	40.04	3	41.67	1	56.00	1	23.98
041000110103	Mills Creek	30.70	1.32	95.69	66	41.68	0	0.00	0	0.00	0	0.00
041000110201	Little Pickerel Creek-Frontal Sandusky Bay	54.52	12.84	76.46	152	55.47	0	0.00	0	0.00	0	0.00
041000110202	Strong Creek	40.89	5.79	85.85	42	54.43	0	0.00	0	0.00	0	0.00
041000110203	Pickerel Creek-Frontal Sandusky Bay	27.16	3.01	88.92	89	55.64	3	45.33	1	72.00	1	37.60
041000110204	Racoon Creek-Frontal Sandusky Bay	38.08	11.89	68.78	100	51.17	0	0.00	0	0.00	0	0.00
041000110205	South Creek-Frontal Sandusky Bay	37.92	4.89	87.11	47	47.10	0	0.00	0	0.00	0	0.00
041000110301	Brandywine Creek-Broken Sword Creek	34.08	2.38	93.02	290	60.39	1	28.00	1	16.00	1	1.54
041000110302	Indian Run-Broken Sword Creek	24.61	1.35	94.50	204	58.14	0	0.00	0	0.00	0	0.00
041000110401	Paramour Creek	32.63	1.04	96.83	98	45.82	0	0.00	0	0.00	0	0.00
041000110402	Loss Creek-Sandusky River	26.23	2.01	92.34	79	57.45	0	0.00	0	0.00	0	0.00
041000110403	Riley Reservoir-Sandusky River	34.31	1.98	94.24	192	51.31	0	0.00	0	0.00	0	0.00
041000110404	Grass Run	38.75	1.19	96.94	90	54.01	0	0.00	0	0.00	0	0.00
041000110405	Town of Wyandot-Sandusky River	33.61	1.75	94.81	111	60.91	1	68.00	1	84.00	1	66.44
041000110501	Prairie Run	44.72	2.60	94.18	49	61.20	0	0.00	0	0.00	0	0.00
041000110502	Headwaters Tymochtee Creek	47.42	2.02	95.73	79	63.38	0	0.00	0	0.00	0	0.00
041000110503	Carroll Ditch	35.34	1.38	96.09	49	64.80	0	0.00	0	0.00	0	0.00
041000110504	Paw Paw Run	21.97	1.41	93.56	81	45.71	0	0.00	0	0.00	0	0.00
041000110505	Reevhorn Run	61.04	0.21	99.66	32	36.40	0	0.00	0	0.00	0	0.00
041000110506	Upper Little Tymochtee Creek	37.83	0.64	98.31	92	44.43	0	0.00	0	0.00	0	0.00
041000110507	Lower Little Tymochtee Creek	78.00	7.14	90.84	259	50.03	3	66.83	2	57.00	2	52.73
041000110508	Warpole Creek	47.70	1.10	97.69	138	64.91	0	0.00	0	0.00	0	0.00
041000110509	Enoch Creek-Tymochtee Creek	29.61	1.10	96.27	285	51.45	0	0.00	0	0.00	0	0.00
041000110601	Oak Run	30.45	0.62	97.95	122	49.80	0	0.00	0	0.00	0	0.00
041000110602	Baughman Run-Tymochtee Creek	31.11	0.86	97.24	162	58.99	0	0.00	0	0.00	0	0.00
041000110603	Hart Ditch-Little Tymochtee Creek	42.22	0.83	98.04	184	30.20	0	0.00	0	0.00	0	0.00
041000110604	Spring Run	45.87	0.25	99.46	47	41.31	0	0.00	0	0.00	0	0.00
041000110605	Lick Run-Tymochtee Creek	38.35	0.87	97.73	139	44.27	0	0.00	0	0.00	0	0.00
041000110701	Little Sandusky River	44.68	1.09	97.55	242	41.99	4	64.50	1	64.00	1	62.94
041000110702	Town of Upper Sandusky-Sandusky River	26.05	0.69	97.34	100	32.59	0	0.00	0	0.00	0	0.00
041000110703	Negro Run	19.39	0.60	96.89	61	57.40	0	0.00	0	0.00	0	0.00
041000110704	Cranberry Run-Sandusky River	23.27	0.57	97.55	101	40.79	0	0.00	0	0.00	0	0.00
041000110705	Sugar Run-Sandusky River	27.11	1.15	95.75	137	37.94	0	0.00	0	0.00	0	0.00
041000110801	Brokenknife Creek	27.73	2.64	90.49	106	56.00	0	0.00	0	0.00	0	0.00
041000110802	Upper Honey Creek	46.72	6.27	86.58	120	78.87	3	39.17	3	54.00	3	39.83
041000110803	Aicholz Ditch	26.61	1.73	93.50	29	61.53	0	0.00	0	0.00	0	0.00
041000110804	Silver Creek	21.16	2.41	88.60	72	57.69	1	36.00	1	19.00	1	17.79
041000110805	Middle Honey Creek	19.59	2.55	86.98	74	58.09	0	0.00	0	0.00	0	0.00
041000110806	Lower Honey Creek	16.71	1.59	90.49	81	57.50	0	0.00	0	0.00	0	0.00

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041000110901	Taylor Run	28.26	0.82	97.09	112	35.69	0	0.00	0	0.00	0	0.00
041000110902	Headwaters Sycamore Creek	28.99	4.09	85.90	244	65.77	0	0.00	0	0.00	0	0.00
041000110903	Greasy Run-Sycamore Creek	22.80	1.60	92.99	149	51.85	0	0.00	0	0.00	0	0.00
041000110904	Thorn Run-Sandusky River	24.69	0.45	98.16	53	47.29	0	0.00	0	0.00	0	0.00
041000110905	Mile Run-Sandusky River	12.23	1.03	91.56	30	59.92	1	73.50	1	46.00	1	45.61
041000111001	East Branch East Branch Wolf Creek	32.57	0.79	97.56	30	44.50	0	0.00	0	0.00	0	0.00
041000111002	Town of New Riegel-East Branch Wolf Creek	28.16	0.71	97.48	19	55.44	0	0.00	0	0.00	0	0.00
041000111003	Snuff Creek-East Branch Wolf Creek	42.85	0.76	98.22	17	64.07	0	0.00	0	0.00	0	0.00
041000111004	Plum Run-Wolf Creek	49.37	1.09	97.78	71	56.62	0	0.00	0	0.00	0	0.00
041000111101	Rock Creek	10.77	1.00	90.75	48	50.21	0	0.00	0	0.00	0	0.00
041000111102	Morrison Creek	15.61	1.08	93.10	18	47.07	0	0.00	0	0.00	0	0.00
041000111103	Willow Creek-Sandusky River	15.06	0.24	98.38	15	35.85	0	0.00	0	0.00	0	0.00
041000111104	Sugar Creek	17.10	0.62	96.38	16	59.01	0	0.00	0	0.00	0	0.00
041000111105	Spicer Creek-Sandusky River	19.78	0.60	96.96	16	55.40	0	0.00	0	0.00	0	0.00
041000111201	Westerhouse Ditch	15.76	1.12	92.89	27	59.46	0	0.00	0	0.00	0	0.00
041000111202	Beaver Creek	16.74	1.32	92.14	47	56.65	0	0.00	0	0.00	0	0.00
041000111203	Flag Run-Green Creek	23.96	4.18	82.57	71	52.03	0	0.00	0	0.00	0	0.00
041000111301	Muskellunge Creek	59.25	0.98	98.34	33	56.59	0	0.00	0	0.00	0	0.00
041000111302	Indian Creek-Sandusky River	29.75	0.86	97.12	21	38.40	0	0.00	0	0.00	0	0.00
041000111303	Yellow Swale-Frontal Muddy Creek Bay	37.48	12.53	66.58	128	47.11	0	0.00	0	0.00	0	0.00
041000111401	Gries Ditch	60.01	0.53	99.12	17	64.31	0	0.00	0	0.00	0	0.00
041000111402	Town of Helena-Muddy Creek	65.93	0.74	98.89	39	53.76	0	0.00	0	0.00	0	0.00
041000111403	Little Muddy Creek	62.94	2.42	96.15	56	47.03	0	0.00	0	0.00	0	0.00
041000111404	Town of Lindsey-Muddy Creek	57.96	6.39	88.98	104	39.50	0	0.00	0	0.00	0	0.00
041000111405	Town of Gypsum-Frontal Sandusky Bay	58.28	15.98	72.57	148	48.82	1	50.00	1	60.00	1	33.05
041000120101	Clear Creek-Vermilion River	18.07	3.12	82.75	142	66.34	2	79.00	3	70.33	3	73.06
041000120102	Buck Creek	15.82	3.18	79.92	107	60.63	0	0.00	0	0.00	0	0.00
041000120103	Southwest Branch Vermilion River	10.92	6.58	39.73	205	55.38	0	0.00	0	0.00	0	0.00
041000120104	New London Upground Reservoir-Vermilion River	11.01	5.15	53.20	153	68.23	2	77.50	2	84.50	2	81.32
041000120105	Indian Creek-Vermilion River	16.22	5.60	65.47	204	68.10	0	0.00	0	0.00	0	0.00
041000120201	East Branch Vermilion River	16.26	5.91	63.64	266	63.63	2	72.00	2	72.00	2	67.37
041000120202	East Fork Vermilion River	21.13	2.19	89.61	172	57.65	1	24.00	1	6.00	1	6.92
041000120203	Town of Wakeman-Vermilion River	17.42	5.30	69.57	118	65.76	0	0.00	0	0.00	0	0.00
041000120204	Town of Vermilion-Vermilion River	21.92	3.28	85.02	84	68.64	0	0.00	0	0.00	0	0.00
041000120301	Sugar Creek-Frontal Lake Erie	43.77	2.36	94.61	59	66.30	0	0.00	0	0.00	0	0.00
041000120302	Chappel Creek	21.91	3.49	84.06	115	60.13	1	70.00	1	63.00	1	36.19
041000120303	Cranberry Creek-Frontal Lake Erie	33.14	1.03	96.90	25	56.09	2	47.50	3	34.00	2	47.65
041000120304	Old Woman Creek	23.39	2.74	88.28	77	53.23	3	64.50	3	33.33	3	32.51
041000120401	Marsh Run	39.40	1.62	95.89	108	46.14	0	0.00	0	0.00	0	0.00

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041000120402	Town of Plymouth-West Branch Huron River	16.70	2.90	82.65	247	55.44	1	64.00	1	61.00	1	59.31
041000120403	Walnut Creek-West Branch Huron River	10.50	9.73	7.28	106	67.30	0	0.00	0	0.00	0	0.00
041000120404	Holliday Lake	6.10	7.50	0.00	63	51.23	0	0.00	0	0.00	0	0.00
041000120405	Willard Lake-West Branch Huron River	6.98	8.25	0.00	196	66.51	0	0.00	0	0.00	0	0.00
041000120501	Mud Run	9.86	3.38	65.74	32	60.16	0	0.00	0	0.00	0	0.00
041000120502	Slate Run	17.34	1.73	90.03	53	60.08	0	0.00	0	0.00	0	0.00
041000120503	Frink Run	20.92	2.61	87.52	53	62.18	0	0.00	0	0.00	0	0.00
041000120504	Seymour Creek	57.96	0.84	98.54	18	58.00	0	0.00	0	0.00	0	0.00
041000120505	Town of Kimball	58.04	0.41	99.29	15	50.70	0	0.00	0	0.00	0	0.00
041000120506	Town of Monroeville-West Branch Huron River	41.80	2.40	94.26	23	55.11	0	0.00	0	0.00	0	0.00
041000120601	Upper East Branch Huron River	12.39	4.03	67.46	132	57.96	0	0.00	0	0.00	0	0.00
041000120602	Cole Creek	12.46	2.78	77.68	69	55.15	0	0.00	0	0.00	0	0.00
041000120603	Norwalk Creek	7.92	2.74	65.40	40	60.61	0	0.00	0	0.00	0	0.00
041000120604	Lower East Branch Huron River	9.70	3.91	59.69	69	51.14	0	0.00	0	0.00	0	0.00
041000120605	City of Norwalk	9.39	2.92	68.86	46	44.77	0	0.00	0	0.00	0	0.00
041000120606	Mud Brook-Frontal Lake Erie	16.81	3.25	80.67	121	43.52	2	48.75	2	54.00	2	35.85
041100010101	Plum Creek	15.78	1.69	89.30	56	48.52	1	58.00	1	67.00	1	38.06
041100010102	North Branch West Branch Rocky River	8.09	2.59	68.02	137	55.98	0	0.00	0	0.00	0	0.00
041100010103	Headwaters West Branch Rocky River	3.26	1.25	61.72	100	42.00	0	0.00	0	0.00	0	0.00
041100010104	Mallet Creek	6.55	2.84	56.66	75	52.67	0	0.00	0	0.00	0	0.00
041100010105	City of Medina-West Branch Rocky River	5.79	1.83	68.42	88	52.55	0	0.00	0	0.00	0	0.00
041100010106	Cossett Creek-West Branch Rocky River	11.04	2.40	78.23	188	53.82	0	0.00	0	0.00	0	0.00
041100010107	Plum Creek	21.61	3.94	81.75	92	59.88	0	0.00	0	0.00	0	0.00
041100010108	Baker Creek-West Branch Rocky River	16.41	1.83	88.86	66	44.32	0	0.00	0	0.00	0	0.00
041100010201	Headwaters East Branch Rocky River	6.82	1.87	72.53	108	61.54	0	0.00	0	0.00	0	0.00
041100010202	Baldwin Creek-East Branch Rocky River	5.05	3.77	25.20	125	55.04	0	0.00	0	0.00	0	0.00
041100010203	Rocky River	5.97	3.39	43.17	57	41.31	2	40.00	2	48.50	2	28.81
041100010204	Cahoon Creek-Frontal Lake Erie	26.33	0.77	97.06	66	41.74	0	0.00	0	0.00	0	0.00
041100010301	East Fork of East Branch Black River	6.43	2.57	60.06	77	52.51	1	29.00	1	45.00	1	35.89
041100010302	Headwaters West Fork East Branch Black River	16.32	3.17	80.57	191	59.76	0	0.00	0	0.00	0	0.00
041100010303	Coon Creek-East Branch Black River	8.75	1.39	84.09	105	56.36	1	70.00	1	84.00	1	87.88
041100010401	Town of Litchfield-East Branch Black River	12.95	2.27	82.43	144	59.42	0	0.00	0	0.00	0	0.00
041100010402	Salt Creek-East Branch Black River	16.69	2.50	85.04	125	63.42	0	0.00	0	0.00	0	0.00
041100010403	Willow Creek	33.60	1.48	95.60	70	40.61	0	0.00	0	0.00	0	0.00
041100010404	Jackson Ditch-East Branch Black River	24.17	1.65	93.16	130	52.21	0	0.00	0	0.00	0	0.00
041100010501	Charlemont Creek	10.57	1.20	88.61	79	65.25	0	0.00	0	0.00	0	0.00
041100010502	Upper West Branch Black River	13.39	2.47	81.58	210	63.54	0	0.00	0	0.00	0	0.00
041100010503	Wellington Creek	19.39	2.33	87.99	129	55.37	0	0.00	0	0.00	0	0.00
041100010504	Middle West Branch Black River	18.17	1.62	91.11	148	56.73	0	0.00	0	0.00	0	0.00

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041100010505	Plum Creek	28.50	1.11	96.11	54	45.62	0	0.00	0	0.00	0	0.00
041100010506	Lower West Branch Black River	33.47	1.49	95.55	128	57.69	0	0.00	0	0.00	0	0.00
041100010601	French Creek	46.44	1.85	96.02	68	58.35	1	81.50	1	85.00	1	77.89
041100010602	Black River	35.99	1.69	95.30	40	42.58	0	0.00	0	0.00	0	0.00
041100010603	Heider Ditch-Frontal Lake Erie	64.35	0.96	98.51	39	45.58	0	0.00	0	0.00	0	0.00
041100010701	Upper Beaver Creek	29.96	1.19	96.02	51	54.61	0	0.00	0	0.00	0	0.00
041100010702	Lower Beaver Creek	26.74	0.77	97.13	32	52.50	0	0.00	0	0.00	0	0.00
041100010703	Quarry Creek-Frontal Lake Erie	33.08	1.00	96.97	43	62.10	0	0.00	0	0.00	0	0.00
041100020101	East Branch Reservoir-East Branch Cuyahoga River	10.09	14.16	0.00	142	72.47	0	0.00	0	0.00	0	0.00
041100020102	West Branch Cuyahoga River	15.45	13.73	11.13	253	58.25	2	75.00	2	87.50	2	60.17
041100020103	Tare Creek-Cuyahoga River	15.91	17.01	0.00	152	60.62	3	70.83	3	58.33	3	47.39
041100020104	Ladue Reservoir-Bridge Creek	13.32	13.06	1.94	327	61.91	6	69.00	6	70.83	6	68.01
041100020105	Black Brook	24.11	8.63	64.21	75	66.81	1	71.00	1	84.00	1	80.77
041100020106	Sawyer Brook-Cuyahoga River	13.37	15.53	0.00	127	68.46	1	58.00	1	46.00	1	34.03
041100020201	Potter Creek-Breakneck Creek	24.71	5.61	77.31	194	55.04	2	51.50	2	55.00	2	44.55
041100020202	Feeder Canal-Breakneck Creek	21.37	10.11	52.70	326	56.55	1	67.00	1	74.00	1	65.04
041100020203	Lake Rockwell-Cuyahoga River	14.61	5.99	58.96	300	56.09	5	61.90	5	55.60	5	60.50
041100020301	Plum Creek	23.09	8.51	63.14	73	58.86	3	66.17	3	63.00	3	62.33
041100020302	Mogadore Reservoir-Little Cuyahoga River	14.21	4.80	66.19	60	59.04	1	75.00	1	94.00	1	88.27
041100020303	Wingfoot Lake Outlet-Little Cuyahoga River	11.02	3.24	70.56	86	47.54	3	62.67	3	63.67	3	55.23
041100020304	City of Akron-Little Cuyahoga River	1.46	0.30	79.50	12	19.72	0	0.00	0	0.00	0	0.00
041100020305	Fish Creek-Cuyahoga River	9.81	2.37	75.87	91	38.55	1	73.00	1	69.00	1	60.74
041100020401	Mud Brook	16.20	3.74	76.90	148	44.22	2	53.50	2	58.00	2	50.35
041100020402	Yellow Creek	7.70	2.25	70.80	105	44.24	0	0.00	0	0.00	0	0.00
041100020403	Furnace Run	4.03	0.95	76.54	30	56.86	0	0.00	0	0.00	0	0.00
041100020404	BrandywineCreek	12.71	1.53	87.94	53	41.60	0	0.00	0	0.00	0	0.00
041100020405	Boston Run-Cuyahoga River	3.63	1.57	56.82	68	63.31	6	41.67	6	28.50	6	17.38
041100020501	Pond Brook	23.39	10.32	55.87	126	50.94	1	68.00	1	84.00	1	66.07
041100020502	Headwaters Tinkers Creek	17.64	6.78	61.57	136	47.69	5	65.90	5	65.60	5	60.03
041100020503	Headwaters Chippewa Creek	4.21	2.35	44.11	43	55.43	0	0.00	0	0.00	0	0.00
041100020504	Town of Twinsburg-Tinkers Creek	5.84	2.23	61.88	164	49.10	1	65.00	1	74.00	1	63.93
041100020505	Willow Lake-Cuyahoga River	4.62	3.01	34.81	76	59.15	1	49.00	1	24.00	1	30.85
041100020601	Mill Creek	2.70	0.40	85.36	14	30.09	0	0.00	0	0.00	0	0.00
041100020602	Village of Independence-Cuyahoga River	2.41	0.79	67.27	19	48.73	0	0.00	0	0.00	0	0.00
041100020603	Big Creek	3.23	0.40	87.61	36	23.92	0	0.00	0	0.00	0	0.00
041100020604	Town of Cuyahoga Heights-Cuyahoga River	3.28	0.53	83.68	28	25.79	0	0.00	0	0.00	0	0.00
041100020605	City of Cleveland-Cuyahoga River	1.64	0.01	99.31	2	3.00	0	0.00	0	0.00	0	0.00
041100030101	East Branch Ashtabula River	50.93	13.78	72.95	417	78.67	0	0.00	0	0.00	0	0.00
041100030102	West Branch Ashtabula River	54.09	16.67	69.18	349	75.77	0	0.00	0	0.00	0	0.00

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041100030103	Upper Ashtabula River	41.15	10.08	75.50	220	75.76	0	0.00	0	0.00	0	0.00
041100030104	Middle Ashtabula River	33.65	13.45	60.04	291	73.05	0	0.00	0	0.00	0	0.00
041100030105	Lower Ashtabula River	8.52	4.29	49.72	107	40.25	0	0.00	3	31.00	3	23.52
041100030201	Indian Creek-Frontal Lake Erie	10.65	11.45	0.00	293	62.78	0	0.00	0	0.00	0	0.00
041100030202	Wheeler Creek-Frontal Lake Erie	15.16	7.02	53.67	344	64.18	3	62.00	3	53.33	3	34.17
041100030203	Arcola Creek	16.49	5.43	67.10	208	60.09	1	75.00	1	67.00	1	34.89
041100030204	McKinley Creek-Frontal Lake Erie	15.19	3.14	79.33	182	56.13	0	0.00	0	0.00	0	0.00
041100030301	Silver Creek	9.20	5.25	42.91	76	59.71	0	0.00	0	0.00	0	0.00
041100030302	Headwaters Aurora Branch	10.10	4.71	53.37	175	56.23	0	0.00	0	0.00	0	0.00
041100030303	McFarland Creek-Aurora Branch	6.91	2.12	69.24	67	44.84	0	0.00	0	0.00	0	0.00
041100030304	Beaver Creek-Chagrin River	11.05	7.57	31.51	216	62.50	0	0.00	0	0.00	0	0.00
041100030401	East Branch Chagrin River	4.27	0.90	79.03	93	53.78	1	72.00	1	86.00	1	92.20
041100030402	Griswold Creek-Chagrin River	3.08	1.19	61.50	163	48.25	0	0.00	0	0.00	0	0.00
041100030403	Town of Willoughby-Chagrin River	37.00	0.36	99.03	26	28.51	0	0.00	0	0.00	0	0.00
041100030501	Marsh Creek-Frontal Lake Erie	29.11	5.37	81.57	61	45.09	1	34.00	1	57.00	1	40.02
041100030502	City of Euclid-Frontal Lake Erie	44.90	0.04	99.92	4	3.42	0	0.00	0	0.00	0	0.00
041100030503	Euclid Creek	3.31	0.15	95.53	18	22.10	0	0.00	0	0.00	0	0.00
041100030504	Doan Brook-Frontal Lake Erie	1.67	0.03	98.07	5	20.11	0	0.00	2	23.50	2	15.45
041100040101	Dead Branch	15.07	6.50	56.83	413	67.37	0	0.00	0	0.00	0	0.00
041100040102	Lake Estabook-Grand River	8.86	8.18	7.71	232	61.51	0	0.00	0	0.00	0	0.00
041100040103	Baughman Creek	27.86	19.03	31.68	182	71.28	0	0.00	0	0.00	0	0.00
041100040104	Center Creek-Grand River	20.96	14.17	32.40	441	68.89	0	0.00	0	0.00	0	0.00
041100040105	Coffee Creek-Grand River	35.46	37.95	0.00	196	78.40	0	0.00	0	0.00	0	0.00
041100040106	Swine Creek	10.56	9.69	8.27	202	62.99	0	0.00	0	0.00	0	0.00
041100040201	Upper Rock Creek	50.55	18.09	64.22	307	70.53	0	0.00	0	0.00	0	0.00
041100040202	Middle Rock Creek	49.93	12.90	74.17	219	72.78	0	0.00	0	0.00	0	0.00
041100040203	Lower Rock Creek	44.92	7.26	83.84	184	73.69	0	0.00	0	0.00	0	0.00
041100040301	Phelps Creek	21.26	17.53	17.54	235	69.30	1	50.50	1	50.00	1	55.60
041100040302	Hoskins Creek	44.99	21.10	53.10	300	76.30	0	0.00	0	0.00	0	0.00
041100040303	Mill Creek-Grand River	37.24	19.92	46.53	371	72.77	0	0.00	0	0.00	0	0.00
041100040304	Mud Creek	40.20	17.38	56.76	222	80.57	1	76.00	1	84.00	1	86.37
041100040305	Plumb Creek-Grand River	44.23	18.86	57.37	256	78.01	1	74.00	1	91.00	1	90.65
041100040401	Griggs Creek	69.96	21.88	68.73	229	77.38	0	0.00	0	0.00	0	0.00
041100040402	Peters Creek-Mill Creek	53.35	18.04	66.20	693	77.05	0	0.00	0	0.00	0	0.00
041100040403	Town of Jefferson-Mill Creek	53.84	7.92	85.29	316	68.70	0	0.00	0	0.00	0	0.00
041100040501	Badger Run-Three Brothers Creek	48.16	10.35	78.51	279	72.03	3	72.33	2	90.50	2	71.81
041100040502	Bronson Creek-Grand River	33.15	14.96	54.87	302	74.92	2	65.50	2	80.50	2	64.80
041100040601	Coffee Creek-Grand River	42.24	9.09	78.47	236	72.60	0	0.00	0	0.00	0	0.00
041100040602	Mill Creek	28.32	7.64	73.02	109	60.75	0	0.00	0	0.00	0	0.00

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041100040603	Village of Mechanicsville-Grand River	15.25	2.67	82.48	85	73.17	0	0.00	0	0.00	0	0.00
041100040604	Paine Creek	7.80	11.07	0.00	168	68.29	1	64.00	1	50.00	1	35.74
041100040605	Talcott Creek-Grand River	4.52	4.42	2.16	51	69.19	0	0.00	0	0.00	0	0.00
041100040606	Big Creek	5.07	2.54	49.82	160	62.70	0	0.00	0	0.00	0	0.00
041100040607	Red Creek-Grand River	16.29	2.43	85.06	90	40.16	0	0.00	0	0.00	0	0.00
041201010409	Turkey Creek-Frontal Lake Erie	9.66	25.95	0.00	31	62.99	0	0.00	0	0.00	0	0.00
041201010603	West Branch Conneaut Creek	67.44	8.61	87.23	12	86.91	0	0.00	0	0.00	0	0.00
041201010605	Marsh Run-Conneaut Creek	13.08	3.87	70.39	363	59.58	0	0.00	0	0.00	0	0.00
041201010606	Town of North Kingsville-Frontal Lake Erie	10.11	9.71	3.95	284	66.59	1	67.00	1	84.00	1	86.86
050301010401	East Branch Middle Fork Little Beaver Creek	13.56	3.86	71.53	134	38.16	0	0.00	0	0.00	0	0.00
050301010402	Headwaters Middle Fork Little Beaver Creek	12.38	5.41	56.32	284	55.04	0	0.00	0	0.00	0	0.00
050301010403	Stone Mill Run-Middle Fork Little Beaver Creek	3.71	1.85	50.04	109	55.20	0	0.00	0	0.00	0	0.00
050301010404	Lisbon Creek-Middle Fork Little Beaver Creek	1.39	0.92	33.73	56	41.81	0	0.00	0	0.00	0	0.00
050301010405	Elk Run-Middle Fork Little Beaver Creek	1.12	1.09	3.12	59	28.50	0	0.00	0	0.00	0	0.00
050301010501	Cold Run	8.16	6.44	21.04	68	50.96	1	45.50	1	50.00	1	32.98
050301010502	Headwaters West Fork Little Beaver Creek	3.42	3.60	0.00	88	43.22	0	0.00	0	0.00	0	0.00
050301010503	Brush Creek	1.29	2.06	0.00	86	40.60	0	0.00	0	0.00	0	0.00
050301010504	Patterson Creek-West Fork Little Beaver Creek	0.80	0.82	0.00	88	59.77	0	0.00	0	0.00	0	0.00
050301010601	Longs Run	0.35	0.21	39.33	21	39.16	0	0.00	0	0.00	0	0.00
050301010602	Honey Creek	7.63	0.59	92.22	18	29.30	0	0.00	0	0.00	0	0.00
050301010603	Headwaters North Fork Little Beaver Creek	8.05	0.63	92.21	67	44.18	0	0.00	0	0.00	0	0.00
050301010604	Little Bull Creek	3.61	1.48	59.07	52	48.00	0	0.00	0	0.00	0	0.00
050301010605	Headwaters Bull Creek	9.60	3.05	68.20	57	42.86	0	0.00	0	0.00	0	0.00
050301010606	Leslie Run-Bull Creek	1.88	0.42	77.49	60	50.07	0	0.00	0	0.00	0	0.00
050301010607	Dilworth Run-North Fork Little Beaver Creek	0.52	0.13	74.91	5	52.79	0	0.00	0	0.00	0	0.00
050301010608	Brush Run-North Fork Little Beaver Creek	0.31	0.33	0.00	26	61.03	0	0.00	0	0.00	0	0.00
050301010609	Rough Run-Little Beaver Creek	0.31	0.17	45.19	27	55.25	0	0.00	0	0.00	0	0.00
050301010610	Bieler Run-Little Beaver Creek	0.17	0.09	45.56	9	50.97	0	0.00	0	0.00	0	0.00
050301010701	Headwaters Yellow Creek	0.91	0.70	23.09	37	68.93	0	0.00	0	0.00	0	0.00
050301010702	Elkhorn Creek	1.43	1.22	14.40	75	77.37	0	0.00	0	0.00	0	0.00
050301010703	Upper North Fork	0.35	1.34	0.00	48	73.47	0	0.00	0	0.00	0	0.00
050301010704	Long Run-Yellow Creek	1.18	1.13	4.60	39	77.01	1	76.00	1	77.00	1	67.29
050301010801	Town Fork	1.76	1.02	42.19	23	76.67	0	0.00	0	0.00	0	0.00
050301010802	Headwaters North Fork Yellow Creek	0.45	0.62	0.00	36	60.00	0	0.00	0	0.00	0	0.00
050301010803	Salt Run-North Fork Yellow Creek	0.28	0.23	17.96	35	69.65	0	0.00	0	0.00	0	0.00
050301010804	Hollow Rock Run-Yellow Creek	0.75	0.43	42.57	33	67.80	0	0.00	0	0.00	0	0.00
050301011001	Upper Cross Creek	2.52	1.65	34.26	68	64.22	0	0.00	0	0.00	0	0.00
050301011002	Salem Creek	2.23	1.81	18.76	40	68.93	0	0.00	0	0.00	0	0.00
050301011003	Middle Cross Creek	1.65	0.72	56.10	23	64.68	0	0.00	0	0.00	0	0.00

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050301011004	McIntyre Creek	5.16	1.84	64.30	124	57.16	0	0.00	0	0.00	0	0.00
050301011005	Lower Cross Creek	1.83	0.41	77.59	57	63.88	0	0.00	0	0.00	0	0.00
050301011102	Little Yellow Creek	0.39	0.65	0.00	36	59.19	0	0.00	0	0.00	0	0.00
050301011103	Carpenter Run-Ohio River	0.17	0.11	37.33	30	21.00	0	0.00	0	0.00	0	0.00
050301011106	Hardin Run-Ohio River	0.67	0.08	87.44	8	61.57	0	0.00	0	0.00	0	0.00
050301011107	Island Creek	1.50	0.67	55.36	43	68.42	0	0.00	0	0.00	0	0.00
050301011109	Wills Creek-Ohio River	1.29	0.44	66.04	24	45.28	0	0.00	0	0.00	0	0.00
050301020104	Frontal Pymatuning Reservoir	37.00	13.12	64.54	493	69.06	0	0.00	0	0.00	0	0.00
050301020105	Pymatuning Reservoir	0.38	1.08	0.00	11	46.98	0	0.00	0	0.00	0	0.00
050301020301	Headwaters Pymatuning Creek	29.12	14.23	51.13	630	69.13	1	55.50	1	66.00	1	51.90
050301020302	Sugar Creek-Pymatuning Creek	22.53	11.41	49.36	415	71.47	0	0.00	0	0.00	0	0.00
050301020303	Stratton Creek-Pymatuning Creek	20.34	12.99	36.14	228	74.02	0	0.00	0	0.00	0	0.00
050301020304	Booth Run-Pymatuning Creek	14.31	10.28	28.15	250	70.65	1	82.50	1	80.00	1	86.38
050301020401	Sugar Run-Shenango River	24.39	5.01	79.48	1	60.00	0	0.00	0	0.00	0	0.00
050301020601	Yankee Run	14.33	6.17	56.95	336	69.67	0	0.00	0	0.00	0	0.00
050301020602	Little Yankee Run	11.41	3.46	69.64	320	59.10	0	0.00	0	0.00	0	0.00
050301020603	McCullough Run-Shenango River	12.46	1.73	86.13	49	57.52	0	0.00	0	0.00	0	0.00
050301020606	Deer Creek-Shenango River	39.00	4.10	89.49	11	66.78	0	0.00	0	0.00	0	0.00
050301030101	Beaver Run-Mahoning River	7.76	5.33	31.32	272	46.08	2	69.25	2	59.00	2	60.14
050301030102	Beech Creek	12.96	3.55	72.57	186	47.52	0	0.00	0	0.00	0	0.00
050301030103	Fish Creek-Mahoning River	17.46	4.75	72.79	367	50.52	0	0.00	0	0.00	0	0.00
050301030201	Deer Creek	18.19	5.24	71.22	199	63.29	0	0.00	0	0.00	0	0.00
050301030202	Willow Creek	27.52	12.10	56.02	128	72.14	0	0.00	0	0.00	0	0.00
050301030203	Mill Creek	25.02	7.51	69.98	361	66.86	0	0.00	0	0.00	0	0.00
050301030204	Island Creek-Mahoning River	16.65	4.01	75.91	161	60.28	0	0.00	0	0.00	0	0.00
050301030301	Kale Creek	20.03	10.04	49.86	219	69.92	0	0.00	0	0.00	0	0.00
050301030302	Headwaters West Branch Mahoning River	17.51	6.31	63.97	184	59.32	0	0.00	0	0.00	0	0.00
050301030303	Barrel Run	16.23	5.89	63.68	69	62.77	0	0.00	0	0.00	0	0.00
050301030304	Kirwin Reservoir-West Branch Mahoning River	8.06	4.64	42.48	151	69.80	0	0.00	0	0.00	0	0.00
050301030305	Town of Newton Falls-West Branch Mahoning River	18.46	13.49	26.93	232	70.35	0	0.00	0	0.00	0	0.00
050301030306	Charley Run Creek-Mahoning River	19.36	3.00	84.51	271	60.04	0	0.00	0	0.00	0	0.00
050301030401	Headwaters Eagle Creek	14.20	7.34	48.29	73	64.43	1	70.00	1	91.00	1	83.81
050301030402	South Fork Eagle Creek	21.48	11.17	47.98	159	74.73	0	0.00	0	0.00	0	0.00
050301030403	Camp Creek-Eagle Creek	16.79	8.77	47.80	142	70.52	5	74.80	5	82.40	5	72.01
050301030404	Tinkers Creek	24.57	12.70	48.32	132	66.61	0	0.00	0	0.00	0	0.00
050301030405	Mouth Eagle Creek	25.71	9.86	61.66	250	71.14	0	0.00	0	0.00	0	0.00
050301030406	Chocolate Run-Mahoning River	18.50	5.47	70.42	264	63.79	0	0.00	0	0.00	0	0.00
050301030501	Upper Mosquito Creek	34.88	14.21	59.27	273	78.29	0	0.00	0	0.00	0	0.00
050301030502	Middle Mosquito Creek	19.92	11.54	42.07	575	72.79	0	0.00	0	0.00	0	0.00

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050301030503	Lower Mosquito Creek	14.89	5.39	63.82	297	57.10	0	0.00	0	0.00	0	0.00
050301030601	Duck Creek	24.59	5.72	76.75	428	57.24	0	0.00	0	0.00	0	0.00
050301030602	Mud Creek	16.07	2.31	85.65	112	49.54	0	0.00	0	0.00	0	0.00
050301030603	City of Warren-Mahoning River	13.39	3.48	74.05	314	50.04	0	0.00	0	0.00	0	0.00
050301030701	Upper Meander Creek	21.68	4.85	77.62	212	57.52	0	0.00	0	0.00	0	0.00
050301030702	Middle Meander Creek	19.66	2.17	88.95	250	56.29	0	0.00	0	0.00	0	0.00
050301030703	Lower Meander Creek	18.62	2.58	86.13	196	55.59	0	0.00	0	0.00	0	0.00
050301030704	Squaw Creek	9.93	3.33	66.46	186	55.51	0	0.00	0	0.00	0	0.00
050301030705	Little Squaw Creek-Mahoning River	5.99	0.49	91.85	51	37.34	0	0.00	0	0.00	0	0.00
050301030801	Headwaters Mill Creek	23.24	7.30	68.60	154	50.33	0	0.00	0	0.00	0	0.00
050301030802	Indian Run	22.01	1.03	95.34	38	47.01	0	0.00	0	0.00	0	0.00
050301030803	Andersons Run-Mill Creek	16.54	0.95	94.26	47	39.85	0	0.00	0	0.00	0	0.00
050301030804	Crab Creek	10.32	1.39	86.49	110	55.33	0	0.00	0	0.00	0	0.00
050301030805	Headwaters Yellow Creek	9.39	2.19	76.63	78	46.32	0	0.00	0	0.00	0	0.00
050301030806	Burgess Run-Yellow Creek	17.00	3.14	81.51	85	48.57	0	0.00	0	0.00	0	0.00
050301030807	Dry Run-Mahoning River	13.65	3.44	74.80	126	60.01	0	0.00	0	0.00	0	0.00
050301030808	Hickory Run	22.13	0.83	96.24	25	41.18	0	0.00	0	0.00	0	0.00
050301030809	Coffee Run-Mahoning River	14.02	3.48	75.18	136	46.58	0	0.00	0	0.00	0	0.00
050301060201	South Fork Short Creek	5.60	1.08	80.71	41	62.96	0	0.00	0	0.00	0	0.00
050301060202	Middle Fork Short Creek	4.31	1.73	59.81	55	59.70	0	0.00	0	0.00	0	0.00
050301060203	North Fork Short Creek	4.12	2.30	44.20	60	68.25	0	0.00	0	0.00	0	0.00
050301060204	Piney Fork	3.68	0.97	73.48	55	48.92	0	0.00	0	0.00	0	0.00
050301060205	Perrin Run-Short Creek	2.06	0.61	70.43	52	62.09	0	0.00	0	0.00	0	0.00
050301060206	Little Short Creek	1.13	0.72	36.20	48	52.83	0	0.00	0	0.00	0	0.00
050301060207	Dry Fork-Short Creek	2.38	1.30	45.41	103	38.94	0	0.00	0	0.00	0	0.00
050301060301	Crabapple Creek	4.69	1.97	57.99	114	57.03	0	0.00	0	0.00	0	0.00
050301060302	Headwaters Wheeling Creek	1.69	1.16	31.22	87	42.19	0	0.00	0	0.00	0	0.00
050301060303	Cox Run-Wheeling Creek	2.15	0.76	64.64	156	59.93	0	0.00	0	0.00	0	0.00
050301060304	Flat Run-Wheeling Creek	1.11	0.22	80.47	38	43.11	0	0.00	0	0.00	0	0.00
050301060701	Williams Creek	0.57	0.20	65.04	15	61.89	0	0.00	0	0.00	0	0.00
050301060702	Upper McMahon Creek	0.48	0.45	6.57	64	47.01	0	0.00	0	0.00	0	0.00
050301060703	Little McMahon Creek	1.13	0.25	77.52	25	39.24	0	0.00	0	0.00	0	0.00
050301060704	Lower McMahon Creek	0.84	0.27	67.67	38	50.67	0	0.00	0	0.00	0	0.00
050301060901	North Fork Captina Creek	0.54	0.35	34.14	73	54.62	0	0.00	0	0.00	0	0.00
050301060902	South Fork Captina Creek	0.44	0.27	37.36	52	61.80	0	0.00	0	0.00	0	0.00
050301060903	Bend Fork	0.23	0.15	32.52	31	50.81	0	0.00	0	0.00	0	0.00
050301060904	Piney Creek-Captina Creek	0.56	0.15	74.10	15	55.54	0	0.00	0	0.00	0	0.00
050301060905	Pea Vine Creek-Captina Creek	0.56	0.27	51.71	44	51.94	0	0.00	0	0.00	0	0.00
050301060906	Cat Run-Captina Creek	0.62	0.31	50.39	25	39.19	0	0.00	0	0.00	0	0.00

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050301061201	Rush Run	2.43	0.81	66.79	52	60.77	0	0.00	0	0.00	0	0.00
050301061202	Salt Run-Ohio River	2.32	0.65	72.04	74	44.78	0	0.00	0	0.00	0	0.00
050301061204	Glenns Run-Ohio River	1.07	0.61	43.18	47	28.57	0	0.00	0	0.00	0	0.00
050301061205	Boggs Run-Ohio River	0.77	0.60	22.37	9	16.14	0	0.00	0	0.00	0	0.00
050301061206	Wegee Creek-Ohio River	0.63	0.26	59.76	12	60.60	0	0.00	0	0.00	0	0.00
050301061207	Pipe Creek-Ohio River	0.48	0.28	42.04	30	57.68	0	0.00	0	0.00	0	0.00
050301061208	Big Run-Ohio River	0.06	0.03	60.22	2	36.67	0	0.00	0	0.00	0	0.00
050302010101	Upper Sunfish Creek	0.21	0.02	89.54	11	58.84	0	0.00	0	0.00	0	0.00
050302010102	Piney Fork	0.18	0.08	56.18	5	72.60	0	0.00	0	0.00	0	0.00
050302010103	Middle Sunfish Creek	0.10	0.13	0.00	15	69.29	0	0.00	0	0.00	0	0.00
050302010104	Lower Sunfish Creek	0.09	0.08	5.63	15	57.68	0	0.00	0	0.00	0	0.00
050302010601	Rich Fork	0.15	0.04	77.15	6	74.09	0	0.00	0	0.00	0	0.00
050302010602	Cranenest Fork	0.17	0.18	0.00	16	72.94	0	0.00	0	0.00	0	0.00
050302010603	Wolfpen Run-Little Muskingum River	0.18	0.03	85.51	3	59.33	0	0.00	0	0.00	0	0.00
050302010604	Witten Fork	0.17	0.07	61.11	20	72.27	0	0.00	0	0.00	0	0.00
050302010605	Straight Fork-Little Muskingum River	0.26	0.32	0.00	48	60.88	0	0.00	0	0.00	0	0.00
050302010701	Clear Fork Little Muskingum River	0.23	0.01	95.76	15	67.59	0	0.00	0	0.00	0	0.00
050302010702	Archers Fork	0.53	0.23	56.98	16	70.63	0	0.00	0	0.00	0	0.00
050302010703	Wingett Run-Little Muskingum River	0.62	0.23	62.43	22	50.70	0	0.00	0	0.00	0	0.00
050302010704	Fifteen Mile Creek	0.61	0.01	97.57	6	68.54	0	0.00	0	0.00	0	0.00
050302010705	Eightmile Creek-Little Muskingum River	0.86	0.15	82.33	37	25.49	0	0.00	0	0.00	0	0.00
050302010801	Upper East Fork Duck Creek	1.00	0.32	67.45	45	53.49	0	0.00	0	0.00	0	0.00
050302010802	Middle Fork Duck Creek	2.27	0.97	57.22	139	64.37	0	0.00	0	0.00	0	0.00
050302010803	Middle East Fork Duck Creek	1.39	0.34	75.61	134	64.60	0	0.00	0	0.00	0	0.00
050302010804	Paw Paw Creek	0.48	0.40	16.15	24	50.97	0	0.00	0	0.00	0	0.00
050302010805	Lower East Fork Duck Creek	1.76	2.40	0.00	66	61.24	0	0.00	0	0.00	0	0.00
050302010901	Headwaters West Fork Duck Creek	1.36	0.27	80.32	143	53.79	0	0.00	0	0.00	0	0.00
050302010902	Buffalo Run-West Fork Duck Creek	2.07	0.83	60.10	165	65.07	0	0.00	0	0.00	0	0.00
050302010903	New Years Creek-Duck Creek	0.71	0.15	79.34	25	57.13	0	0.00	0	0.00	0	0.00
050302010904	Sugar Creek-Duck Creek	1.22	0.39	67.93	36	20.25	0	0.00	0	0.00	0	0.00
050302011001	Stillhouse Run-Ohio River	0.03	1.14	0.00	17	33.43	0	0.00	0	0.00	0	0.00
050302011002	Opossum Creek	0.06	0.27	0.00	22	58.23	0	0.00	0	0.00	0	0.00
050302011004	Haynes Run-Ohio River	0.06	0.48	0.00	17	42.95	0	0.00	0	0.00	0	0.00
050302011005	Patton Run-Ohio River	0.11	0.60	0.00	31	41.86	0	0.00	0	0.00	0	0.00
050302011006	Mill Creek-Ohio River	0.67	0.59	11.39	46	42.25	0	0.00	0	0.00	0	0.00
050302011007	Leith Run-Ohio River	0.64	0.66	0.00	47	49.32	0	0.00	0	0.00	0	0.00
050302011009	Cow Creek-Ohio River	1.48	0.59	59.89	57	35.88	0	0.00	0	0.00	0	0.00
050302011010	Bull Creek-Ohio River	5.16	2.62	49.17	23	10.90	0	0.00	0	0.00	0	0.00
050302020102	Mile Run-Ohio River	1.25	0.35	72.29	43	38.16	0	0.00	0	0.00	0	0.00

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050302020103	Headwaters Little Hocking River	0.79	0.14	82.83	50	45.75	0	0.00	0	0.00	0	0.00
050302020104	West Branch Little Hocking River	0.68	0.67	1.99	75	77.52	0	0.00	0	0.00	0	0.00
050302020105	Little West Branch Little Hocking River-Little Hocking River	0.75	0.07	91.06	23	47.96	0	0.00	0	0.00	0	0.00
050302020106	Sandy Creek-Ohio River	1.83	0.30	83.58	42	21.38	0	0.00	0	0.00	0	0.00
050302020201	Headwaters West Branch Shade River	2.81	1.77	36.93	105	57.25	0	0.00	0	0.00	0	0.00
050302020202	Kingsbury Creek	0.29	0.49	0.00	36	59.08	0	0.00	0	0.00	0	0.00
050302020203	Headwaters Middle Branch Shade River	1.76	0.36	79.40	56	60.83	0	0.00	0	0.00	0	0.00
050302020204	Elk Run-Middle Branch Shade River	0.09	0.39	0.00	34	55.23	0	0.00	0	0.00	0	0.00
050302020205	Walker Run-West Branch Shade River	0.06	0.70	0.00	65	58.36	0	0.00	0	0.00	0	0.00
050302020301	Horse Cave Creek	0.05	0.04	33.54	14	42.16	0	0.00	0	0.00	0	0.00
050302020302	Headwaters East Branch Shade River	1.77	0.24	86.31	31	52.94	0	0.00	0	0.00	0	0.00
050302020303	Big Run-East Branch Shade River	0.00	0.05	0.00	11	53.05	0	0.00	0	0.00	0	0.00
050302020304	Spruce Creek-Shade River	0.06	0.02	57.09	8	32.83	0	0.00	0	0.00	0	0.00
050302020404	Forked Run-Ohio River	0.41	0.27	35.15	37	42.31	0	0.00	0	0.00	0	0.00
050302020701	Headwaters Leading Creek	0.64	0.48	25.43	48	51.03	0	0.00	0	0.00	0	0.00
050302020702	Mud Fork	0.42	0.72	0.00	69	55.95	0	0.00	0	0.00	0	0.00
050302020703	Ogden Run-Leading Creek	0.19	1.34	0.00	112	67.31	0	0.00	0	0.00	0	0.00
050302020704	Little Leading Creek	0.33	0.80	0.00	115	56.99	0	0.00	0	0.00	0	0.00
050302020705	Thomas Fork	0.23	0.11	52.94	34	45.25	0	0.00	0	0.00	0	0.00
050302020706	Parker Run-Leading Creek	0.15	0.92	0.00	180	61.52	0	0.00	0	0.00	0	0.00
050302020802	Groundhog Creek-Ohio River	0.04	0.44	0.00	18	56.95	0	0.00	0	0.00	0	0.00
050302020803	Oldtown Creek-Ohio River	0.03	0.15	0.00	17	46.15	0	0.00	0	0.00	0	0.00
050302020804	West Creek-Ohio River	0.09	0.35	0.00	56	45.11	0	0.00	0	0.00	0	0.00
050302020805	Broad Run-Ohio River	0.13	0.15	0.00	16	34.71	0	0.00	0	0.00	0	0.00
050302020901	Kyger Creek	2.26	0.22	90.47	49	57.15	0	0.00	0	0.00	0	0.00
050302020902	Campaign Creek	0.41	0.21	48.84	51	55.49	0	0.00	0	0.00	0	0.00
050302020904	Crooked Creek-Ohio River	1.57	0.41	74.14	8	24.22	0	0.00	0	0.00	0	0.00
050302040101	Center Branch	4.16	0.91	78.22	68	58.93	0	0.00	0	0.00	0	0.00
050302040102	Headwaters Rush Creek	6.96	1.85	73.44	167	47.91	0	0.00	0	0.00	0	0.00
050302040103	Clark Run-Rush Creek	6.66	1.73	74.08	130	63.93	0	0.00	0	0.00	0	0.00
050302040201	Headwaters Little Rush Creek	13.32	0.98	92.66	67	57.06	0	0.00	0	0.00	0	0.00
050302040202	Indian Creek-Little Rush Creek	18.31	0.27	98.50	40	57.71	0	0.00	0	0.00	0	0.00
050302040203	Raccoon Run	6.98	0.27	96.16	26	34.48	0	0.00	0	0.00	0	0.00
050302040204	Turkey Run-Rush Creek	2.66	0.85	68.00	146	50.35	0	0.00	0	0.00	0	0.00
050302040301	Headwaters Clear Creek	22.01	0.27	98.79	50	37.27	0	0.00	0	0.00	0	0.00
050302040302	Mouth Clear Creek	3.23	0.07	97.96	27	35.32	0	0.00	0	0.00	0	0.00
050302040401	Headwaters Hocking River	17.65	0.78	95.60	74	30.58	0	0.00	0	0.00	0	0.00
050302040402	Baldwin Run	10.84	0.04	99.64	3	33.36	0	0.00	0	0.00	0	0.00
050302040403	Pleasant Run	13.99	0.17	98.81	16	17.24	0	0.00	0	0.00	0	0.00

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050302040404	Tarhe Run-Hocking River	2.71	0.18	93.48	20	28.09	0	0.00	0	0.00	0	0.00
050302040405	Buck Run-Hocking River	0.78	0.31	60.63	49	56.14	0	0.00	0	0.00	0	0.00
050302040501	Little Monday Creek	1.33	0.38	71.74	53	55.91	0	0.00	0	0.00	0	0.00
050302040502	Lost Run-Monday Creek	2.85	1.44	49.45	99	66.06	5	61.90	2	67.50	2	57.02
050302040503	Snow Fork	0.79	0.64	19.65	70	64.75	0	0.00	0	0.00	0	0.00
050302040504	Kitchen Run-Monday Creek	1.12	1.82	0.00	148	65.76	1	52.00	1	75.00	1	46.49
050302040601	Clear Fork	1.17	0.42	64.10	22	65.00	0	0.00	0	0.00	0	0.00
050302040602	Scott Creek	0.80	0.21	73.98	41	53.65	0	0.00	0	0.00	0	0.00
050302040603	Oldtown Creek	0.81	0.40	49.91	32	32.16	0	0.00	0	0.00	0	0.00
050302040604	Fivemile Creek	0.68	0.44	35.45	45	60.66	0	0.00	0	0.00	0	0.00
050302040605	Harper Run-Hocking River	1.27	0.54	57.64	71	44.06	0	0.00	0	0.00	0	0.00
050302040606	Dorr Run-Hocking River	0.87	1.27	0.00	137	44.51	2	43.00	2	68.00	2	34.33
050302040701	East Branch Sunday Creek	0.83	0.52	37.11	49	71.54	1	52.00	0	0.00	0	0.00
050302040702	Dotson Creek-Sunday Creek	0.62	0.37	40.53	44	62.78	0	0.00	0	0.00	0	0.00
050302040703	West Branch Sunday Creek	1.80	0.72	60.22	98	58.75	1	52.50	1	61.00	1	35.71
050302040704	Greens Run-Sunday Creek	1.28	1.43	0.00	168	45.98	2	56.75	0	0.00	0	0.00
050302040801	Hamley Run-Hocking River	0.88	1.75	0.00	130	47.03	1	54.00	0	0.00	0	0.00
050302040802	Headwaters Margaret Creek	5.86	0.49	91.68	107	38.93	0	0.00	0	0.00	0	0.00
050302040803	Factory Creek-Margaret Creek	7.85	1.03	86.92	94	50.35	0	0.00	0	0.00	0	0.00
050302040804	Coates Run-Hocking River	1.04	1.84	0.00	86	29.15	0	0.00	0	0.00	0	0.00
050302040901	Miners and Hyde Forks	2.26	0.55	75.64	32	55.81	0	0.00	0	0.00	0	0.00
050302040902	McDougall Branch	4.26	0.35	91.89	67	60.91	0	0.00	0	0.00	0	0.00
050302040903	Kasler Creek-Federal Creek	7.61	0.08	98.94	19	49.48	0	0.00	0	0.00	0	0.00
050302040904	Sharps Fork	2.73	0.73	73.12	71	64.32	0	0.00	0	0.00	0	0.00
050302040905	Big Run-Federal Creek	2.66	0.32	87.85	38	78.23	0	0.00	0	0.00	0	0.00
050302041001	Willow Creek-Hocking River	0.45	0.74	0.00	68	45.67	0	0.00	0	0.00	0	0.00
050302041002	Piper Run-Hocking River	1.93	0.79	58.76	54	47.19	0	0.00	0	0.00	0	0.00
050302041003	Fourmile Creek	0.49	0.15	68.72	9	55.76	0	0.00	0	0.00	0	0.00
050302041004	Frost Run-Hocking River	3.32	0.57	82.91	76	51.52	0	0.00	0	0.00	0	0.00
050400010101	Headwaters Tuscarawas River	17.13	4.34	74.65	196	39.88	0	0.00	0	0.00	0	0.00
050400010102	Pigeon Creek	24.21	3.46	85.71	68	45.93	1	60.00	0	0.00	0	0.00
050400010103	Hudson Run	3.32	0.94	71.67	30	40.01	0	0.00	0	0.00	0	0.00
050400010104	Wolf Creek	8.32	4.53	45.61	137	56.27	0	0.00	0	0.00	0	0.00
050400010105	Portage Lakes-Tuscarawas River	7.48	3.38	54.88	86	47.77	0	0.00	0	0.00	0	0.00
050400010201	Headwaters Chippewa Creek	11.38	4.44	60.99	90	43.85	0	0.00	0	0.00	0	0.00
050400010202	Hubbard Creek-Chippewa Creek	10.61	2.95	72.19	112	48.19	0	0.00	0	0.00	0	0.00
050400010203	Little Chippewa Creek	13.94	0.76	94.58	62	33.75	0	0.00	0	0.00	0	0.00
050400010204	River Styx	9.41	1.29	86.25	104	34.53	0	0.00	0	0.00	0	0.00
050400010205	Tommy Run-Chippewa Creek	15.09	2.91	80.69	147	53.06	0	0.00	0	0.00	0	0.00

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050400010206	Red Run	9.18	0.64	93.04	40	32.62	0	0.00	0	0.00	0	0.00
050400010207	Silver Creek-Chippewa Creek	11.94	6.90	42.25	128	55.54	0	0.00	0	0.00	0	0.00
050400010301	Pancake Creek-Tuscarawas River	9.60	5.02	47.67	66	47.71	0	0.00	0	0.00	0	0.00
050400010302	Nimisila Reservoir-Nimisila Creek	11.99	4.34	63.84	104	52.63	3	84.67	2	63.00	2	67.78
050400010303	Lake Lucern-Nimisila Creek	16.17	10.34	36.04	74	53.08	0	0.00	0	0.00	0	0.00
050400010304	Fox Run	13.92	6.62	52.43	65	68.95	0	0.00	0	0.00	0	0.00
050400010305	Town of Canal Fulton-Tuscarawas River	10.92	6.27	42.58	86	39.27	0	0.00	0	0.00	0	0.00
050400010306	Headwaters Newman Creek	11.75	0.96	91.87	55	38.03	0	0.00	0	0.00	0	0.00
050400010307	Town of North Lawrence-Newman Creek	7.50	2.15	71.29	51	39.17	0	0.00	0	0.00	0	0.00
050400010308	Sippo Creek	12.17	2.59	78.74	59	33.89	0	0.00	0	0.00	0	0.00
050400010309	West Sippo Creek-Tuscarawas River	8.51	3.14	63.05	118	41.23	0	0.00	0	0.00	0	0.00
050400010401	Conser Run	8.57	5.22	39.09	97	49.31	0	0.00	0	0.00	0	0.00
050400010402	Middle Branch Sandy Creek	4.66	2.32	50.18	104	32.14	0	0.00	0	0.00	0	0.00
050400010403	Pipes Fork-Still Fork	11.70	5.87	49.83	99	60.23	1	57.00	1	61.00	1	51.19
050400010404	Muddy Fork	7.17	1.16	83.83	30	57.43	0	0.00	0	0.00	0	0.00
050400010405	Reeds Run-Still Fork	10.15	2.41	76.25	76	64.15	0	0.00	0	0.00	0	0.00
050400010406	Headwaters Sandy Creek	6.87	2.90	57.75	169	41.60	0	0.00	0	0.00	0	0.00
050400010501	Swartz Ditch-Middle Branch Nimishillen Creek	23.21	2.68	88.45	148	46.73	0	0.00	0	0.00	0	0.00
050400010502	East Branch Nimishillen Creek	9.93	1.36	86.28	139	26.50	0	0.00	0	0.00	0	0.00
050400010503	West Branch Nimishillen Creek	13.64	1.42	89.59	122	34.54	2	48.00	2	26.00	2	43.21
050400010504	City of Canton-Middle Branch Nimishillen Creek	8.16	1.80	77.91	71	24.39	0	0.00	0	0.00	0	0.00
050400010505	Sherrick Run-Nimishillen Creek	13.83	1.50	89.14	80	30.98	0	0.00	0	0.00	0	0.00
050400010506	Town of East Sparta-Nimishillen Creek	7.35	1.57	78.58	36	28.35	0	0.00	0	0.00	0	0.00
050400010601	Hugle Run	11.68	2.13	81.76	99	45.34	0	0.00	0	0.00	0	0.00
050400010602	Pipe Run	9.24	2.38	74.24	85	68.67	0	0.00	0	0.00	0	0.00
050400010603	Black Run	9.11	2.39	73.77	51	37.89	0	0.00	0	0.00	0	0.00
050400010604	Little Sandy Creek	6.33	3.03	52.21	94	54.24	0	0.00	0	0.00	0	0.00
050400010605	Armstrong Run-Sandy Creek	6.05	2.19	63.79	85	50.68	0	0.00	0	0.00	0	0.00
050400010606	Indian Run-Sandy Creek	4.10	4.79	0.00	156	63.24	0	0.00	0	0.00	0	0.00
050400010607	Beal Run-Sandy Creek	6.85	5.75	16.02	59	59.00	0	0.00	0	0.00	0	0.00
050400010701	Headwaters Upper Conotton Creek	1.96	1.01	48.22	32	62.04	0	0.00	0	0.00	0	0.00
050400010702	Irish Creek	0.54	0.89	0.00	20	60.88	0	0.00	0	0.00	0	0.00
050400010703	Dining Fork	0.99	1.41	0.00	21	47.19	0	0.00	0	0.00	0	0.00
050400010704	Headwaters Middle Conotton Creek	1.99	1.37	30.84	38	62.83	0	0.00	0	0.00	0	0.00
050400010705	North Fork McGuire Creek	0.70	0.83	0.00	43	74.05	0	0.00	0	0.00	0	0.00
050400010706	McGuire Creek	0.98	0.57	41.88	32	67.29	0	0.00	0	0.00	0	0.00
050400010707	Headwaters Lower Conotton Creek	2.88	2.12	26.31	83	67.94	0	0.00	0	0.00	0	0.00
050400010801	Cold Spring Run-Indian Fork	0.82	1.01	0.00	67	65.97	0	0.00	0	0.00	0	0.00
050400010802	Pleasant Valley Run-Indian Fork	1.76	1.50	14.76	61	63.00	0	0.00	0	0.00	0	0.00

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050400010803	Thompson Run-Conotton Creek	2.00	2.09	0.00	67	62.94	0	0.00	0	0.00	0	0.00
050400010804	Huff Run	1.34	1.31	2.29	35	65.40	0	0.00	0	0.00	0	0.00
050400010805	Dog Run-Conotton Creek	2.70	4.42	0.00	146	63.73	0	0.00	0	0.00	0	0.00
050400010901	Little Sugar Creek	7.72	0.92	88.11	56	29.72	0	0.00	0	0.00	0	0.00
050400010902	Town of Smithville-Sugar Creek	6.52	1.30	80.13	66	33.98	0	0.00	0	0.00	0	0.00
050400010903	North Fork Sugar Creek	2.69	0.80	70.19	30	37.54	0	0.00	0	0.00	0	0.00
050400010904	Town of Brewster-Sugar Creek	7.12	3.55	50.18	91	51.71	0	0.00	0	0.00	0	0.00
050400011001	Upper South Fork Sugar Creek	3.10	0.33	89.40	30	25.95	0	0.00	0	0.00	0	0.00
050400011002	East Branch South Fork Sugar Creek	4.44	0.35	92.21	29	41.40	0	0.00	0	0.00	0	0.00
050400011003	Indian Trail Creek	2.35	1.24	47.41	26	45.17	0	0.00	0	0.00	0	0.00
050400011004	Walnut Creek	2.56	0.87	66.21	37	38.67	0	0.00	0	0.00	0	0.00
050400011005	Lower South Fork Sugar Creek	5.46	8.86	0.00	100	61.93	2	42.00	2	41.00	2	27.53
050400011101	Headwaters Middle Fork Sugar Creek	2.17	0.22	89.71	30	32.70	0	0.00	0	0.00	0	0.00
050400011102	Misers Run-Middle Fork Sugar Creek	7.99	3.89	51.31	50	60.72	0	0.00	0	0.00	0	0.00
050400011103	Beach City Reservoir-Sugar Creek	12.99	6.54	49.64	86	52.83	0	0.00	0	0.00	0	0.00
050400011104	Broad Run	1.82	0.68	62.53	43	48.86	0	0.00	0	0.00	0	0.00
050400011105	Brandywine Creek-Sugar Creek	2.01	1.14	43.08	59	50.01	0	0.00	0	0.00	0	0.00
050400011201	Pigeon Run	4.38	2.32	47.02	26	37.59	0	0.00	0	0.00	0	0.00
050400011202	City of Massillon-Tuscarawas River	6.93	2.20	68.25	60	15.27	0	0.00	0	0.00	0	0.00
050400011203	Wolf Creek-Tuscarawas River	9.20	2.30	75.04	140	44.75	0	0.00	0	0.00	0	0.00
050400011204	Wolf Run-Tuscarawas River	1.22	1.01	16.83	56	50.03	0	0.00	0	0.00	0	0.00
050400011301	Spencer Creek	1.90	2.44	0.00	125	50.39	0	0.00	0	0.00	0	0.00
050400011302	Headwaters Stillwater Creek	1.76	1.97	0.00	65	46.47	0	0.00	0	0.00	0	0.00
050400011303	Boggs Fork	6.98	4.22	39.47	137	56.06	0	0.00	0	0.00	0	0.00
050400011304	Buttermilk Creek-Stillwater Creek	3.93	3.80	3.28	324	60.42	0	0.00	0	0.00	0	0.00
050400011401	Skull Fork	2.34	3.79	0.00	135	73.13	0	0.00	0	0.00	0	0.00
050400011402	Brushy Fork	2.12	1.79	15.80	143	68.74	0	0.00	0	0.00	0	0.00
050400011403	Craborchard Creek-Stillwater Creek	1.19	4.34	0.00	100	76.87	0	0.00	0	0.00	0	0.00
050400011501	Clear Fork	2.92	2.31	20.87	65	65.76	0	0.00	0	0.00	0	0.00
050400011502	Standingstone Fork	3.18	1.13	64.52	34	53.02	0	0.00	0	0.00	0	0.00
050400011503	Upper Little Stillwater Creek	0.45	0.30	33.33	20	61.89	0	0.00	0	0.00	0	0.00
050400011504	Middle Little Stillwater Creek	4.97	2.41	51.57	54	58.94	0	0.00	0	0.00	0	0.00
050400011505	Lower Little Stillwater Creek	5.60	3.49	37.72	47	54.01	0	0.00	0	0.00	0	0.00
050400011601	Laurel Creek	0.83	0.60	27.76	33	69.96	0	0.00	0	0.00	0	0.00
050400011602	Crooked Creek	1.50	0.99	34.17	26	54.48	0	0.00	0	0.00	0	0.00
050400011603	Weaver Run-Stillwater Creek	2.63	2.38	9.40	46	66.40	0	0.00	0	0.00	0	0.00
050400011604	Town of Uhrichsville-Stillwater Creek	4.28	2.27	46.93	107	56.19	0	0.00	0	0.00	0	0.00
050400011701	Stone Creek	1.72	0.47	72.86	28	45.54	0	0.00	0	0.00	0	0.00
050400011702	Oldtown Creek	2.34	0.13	94.57	8	67.16	0	0.00	0	0.00	0	0.00

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050400011703	Beaverdam Creek	4.87	1.95	59.94	47	56.29	0	0.00	0	0.00	0	0.00
050400011704	Pone Run-Tuscarawas River	1.42	2.19	0.00	49	37.99	0	0.00	0	0.00	0	0.00
050400011801	Dunlap Creek	1.23	0.66	46.43	32	63.70	0	0.00	0	0.00	0	0.00
050400011802	Mud Run-Tuscarawas River	1.44	1.24	14.30	90	44.99	0	0.00	0	0.00	0	0.00
050400011803	Buckhorn Creek	1.26	0.26	78.95	23	52.84	0	0.00	0	0.00	0	0.00
050400011804	Blue Ridge Run-Tuscarawas River	2.53	2.05	18.92	45	49.37	0	0.00	0	0.00	0	0.00
050400011901	Evans Creek	2.19	0.57	74.19	35	44.61	0	0.00	0	0.00	0	0.00
050400011902	West Fork White Eyes Creek	3.06	2.04	33.27	45	62.62	0	0.00	0	0.00	0	0.00
050400011903	White Eyes Creek	2.59	0.97	62.37	60	47.25	0	0.00	0	0.00	0	0.00
050400011904	Morgan Run-Tuscarawas River	3.06	2.83	7.53	124	40.18	0	0.00	0	0.00	0	0.00
050400020101	Marsh Run	44.54	1.27	97.15	92	54.59	0	0.00	0	0.00	0	0.00
050400020102	Headwaters Black Fork Mohican River	25.83	0.94	96.37	217	45.40	0	0.00	0	0.00	0	0.00
050400020103	Brubaker Creek	16.44	1.62	90.16	106	51.98	0	0.00	0	0.00	0	0.00
050400020104	Whetstone Creek	17.70	1.62	90.82	81	55.69	2	63.25	2	58.00	2	58.79
050400020105	Shipp Creek-Black Fork Mohican River	24.81	5.04	79.69	525	60.29	2	66.00	2	92.50	2	74.79
050400020201	Village of Pavonia-Black Fork Mohican River	11.91	5.05	57.61	128	58.65	1	31.00	1	13.00	1	15.53
050400020202	Seymour Run-Black Fork	4.24	2.94	30.59	79	65.01	0	0.00	0	0.00	0	0.00
050400020203	Headwaters Rocky Fork	12.51	1.22	90.22	107	38.99	0	0.00	0	0.00	0	0.00
050400020204	Outlet Rocky Fork	5.54	0.61	88.90	105	42.86	1	55.00	1	87.00	1	70.46
050400020205	Charles Mill-Black Fork Mohican River	4.49	3.33	25.90	49	70.94	0	0.00	0	0.00	0	0.00
050400020301	Headwaters Clear Fork Mohican River	9.37	1.39	85.12	252	55.41	0	0.00	0	0.00	0	0.00
050400020302	Cedar Fork	6.42	0.65	89.82	255	50.59	0	0.00	0	0.00	0	0.00
050400020303	Town of Lexington-Clear Fork Mohican River	6.12	1.75	71.35	150	47.30	0	0.00	0	0.00	0	0.00
050400020401	Honey Creek-Clear Fork Mohican River	2.20	0.23	89.39	35	43.03	0	0.00	0	0.00	0	0.00
050400020402	Possum Run	1.77	0.74	57.95	31	46.02	0	0.00	0	0.00	0	0.00
050400020403	Slater Run-Clear Fork Mohican River	1.02	0.10	90.37	13	36.40	0	0.00	0	0.00	0	0.00
050400020404	Pine Run	2.60	0.15	94.03	10	40.65	0	0.00	0	0.00	0	0.00
050400020405	Switzer Creek-Clear Fork Mohican River	2.61	1.03	60.60	34	59.88	0	0.00	0	0.00	0	0.00
050400020501	Upper Muddy Fork Mohican River	11.53	2.21	80.83	238	55.85	1	76.00	1	97.00	1	96.34
050400020502	Middle Muddy Fork Mohican River	7.53	1.64	78.24	139	59.30	0	0.00	0	0.00	0	0.00
050400020503	Lower Muddy Fork Mohican River	15.48	6.83	55.90	281	48.99	0	0.00	0	0.00	0	0.00
050400020601	Lang Creek	11.29	1.23	89.14	94	47.77	0	0.00	0	0.00	0	0.00
050400020602	Orange Creek	11.62	1.77	84.78	199	52.34	0	0.00	0	0.00	0	0.00
050400020603	Katotawa Creek	6.65	1.42	78.67	45	55.93	0	0.00	0	0.00	0	0.00
050400020604	Oldtown Run	3.90	0.79	79.85	46	36.50	0	0.00	0	0.00	0	0.00
050400020605	Jerome Fork-Mohican River	13.70	4.69	65.74	211	57.44	0	0.00	0	0.00	0	0.00
050400020606	Glenn Run-Jerome Fork Mohican River	11.24	5.87	47.73	129	53.95	0	0.00	0	0.00	0	0.00
050400020701	Grab Run	9.77	1.42	85.49	151	53.80	1	78.00	1	76.00	1	75.98
050400020702	Mohicanville Dam-Lake Fork Mohican River	3.20	2.59	19.00	122	59.90	0	0.00	0	0.00	0	0.00

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050400020703	Plum Run-Lake Fork Mohican River	6.81	2.07	69.54	125	53.39	0	0.00	0	0.00	0	0.00
050400020801	Honey Creek	3.49	1.31	62.63	44	48.49	0	0.00	0	0.00	0	0.00
050400020802	Town of Perrysville-Black Fork Mohican River	4.48	2.54	43.29	63	52.09	0	0.00	0	0.00	0	0.00
050400020803	Big Run-Black Fork Mohican River	2.87	0.80	72.09	39	43.60	0	0.00	0	0.00	0	0.00
050400020804	Sigafoos Run-Mohican River	1.18	0.08	93.09	13	45.80	0	0.00	0	0.00	0	0.00
050400020805	Negro Run-Mohican River	0.90	0.09	90.49	17	71.76	0	0.00	0	0.00	0	0.00
050400020806	Flat Run-Mohican River	2.25	0.30	86.87	37	58.95	0	0.00	0	0.00	0	0.00
050400030101	Headwaters North Branch Kokosing River	8.56	0.73	91.42	295	54.94	3	66.17	1	87.00	1	93.36
050400030102	East Branch Kokosing River	8.04	1.66	79.29	92	47.05	0	0.00	0	0.00	0	0.00
050400030103	Job Run-North Branch Kokosing River	7.48	1.26	83.18	58	38.25	0	0.00	0	0.00	0	0.00
050400030201	Headwaters Kokosing River	14.94	2.23	85.04	506	50.37	0	0.00	0	0.00	0	0.00
050400030202	Mile Run-Kokosing River	12.04	2.46	79.60	398	63.11	0	0.00	0	0.00	0	0.00
050400030203	Granny Creek-Kokosing River	9.88	1.03	89.60	105	60.56	0	0.00	0	0.00	0	0.00
050400030301	Dry Creek	9.39	0.80	91.51	201	49.59	0	0.00	0	0.00	0	0.00
050400030302	Armstrong Run-Kokosing River	4.96	0.93	81.35	25	61.20	0	0.00	0	0.00	0	0.00
050400030303	Big Run	12.88	0.77	94.03	76	46.38	0	0.00	0	0.00	0	0.00
050400030304	Delano Run-Kokosing River	7.64	0.67	91.19	67	38.88	3	46.17	3	52.33	3	61.43
050400030305	Little Schenck Creek	4.56	1.05	76.92	30	55.11	0	0.00	0	0.00	0	0.00
050400030306	Schenck Creek	3.82	0.59	84.57	42	47.33	0	0.00	0	0.00	0	0.00
050400030307	Indianfield Run-Kokosing River	2.79	0.77	72.28	46	45.88	0	0.00	0	0.00	0	0.00
050400030401	Little Jelloway Creek	1.12	0.51	54.06	27	52.50	0	0.00	0	0.00	0	0.00
050400030402	Jelloway Creek	3.54	0.46	87.09	79	48.95	0	0.00	0	0.00	0	0.00
050400030403	Brush Run-Kokosing River	1.25	0.41	66.89	47	57.81	0	0.00	0	0.00	0	0.00
050400030501	Headwaters Killbuck Creek	12.18	3.78	69.00	166	45.88	0	0.00	0	0.00	0	0.00
050400030502	Little Killbuck Creek-Killbuck Creek	9.52	4.75	50.06	159	54.16	1	21.50	1	13.00	1	2.04
050400030503	Rathburn Run-Little Killbuck Creek	3.80	0.50	86.81	55	61.95	0	0.00	0	0.00	0	0.00
050400030504	Cedar Run-Killbuck Creek	4.87	2.02	58.56	124	57.95	0	0.00	0	0.00	0	0.00
050400030505	Clear Creek-Killbuck Creek	6.70	1.59	76.33	60	32.48	0	0.00	0	0.00	0	0.00
050400030601	Little Apple Creek	3.45	1.28	62.76	40	38.66	0	0.00	0	0.00	0	0.00
050400030602	Apple Creek	3.72	1.22	67.20	97	34.54	0	0.00	0	0.00	0	0.00
050400030603	Shreve Creek	11.01	6.52	40.74	59	57.75	1	68.50	1	87.00	1	82.64
050400030604	Jennings Ditch-Killbuck Creek	16.99	12.48	26.53	187	51.04	4	51.50	4	30.00	4	38.38
050400030605	North Branch Salt Creek	5.07	1.37	73.02	37	32.08	0	0.00	0	0.00	0	0.00
050400030606	Salt Creek	3.58	1.33	62.75	56	46.15	0	0.00	0	0.00	0	0.00
050400030607	Tea Run-Killbuck Creek	8.91	7.27	18.41	77	59.00	0	0.00	0	0.00	0	0.00
050400030701	Paint Creek	2.21	0.12	94.75	21	49.39	0	0.00	0	0.00	0	0.00
050400030702	Martins Creek	3.81	0.37	90.28	21	42.72	0	0.00	0	0.00	0	0.00
050400030703	Honey Run-Killbuck Creek	5.33	3.91	26.70	33	44.38	1	72.00	1	91.00	1	75.54
050400030704	Black Creek	2.36	0.92	61.06	41	60.55	0	0.00	0	0.00	0	0.00

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050400030705	Shrimplin Creek-Killbuck Creek	4.01	2.01	49.80	108	49.66	0	0.00	0	0.00	0	0.00
050400030801	Wolf Creek	4.10	1.84	55.23	31	70.45	0	0.00	0	0.00	0	0.00
050400030802	Headwaters Doughty Creek	2.87	0.40	85.99	31	40.13	0	0.00	0	0.00	0	0.00
050400030803	Bucks Run-Doughty Creek	2.82	2.32	17.84	72	61.51	0	0.00	0	0.00	0	0.00
050400030804	Big Run-Killbuck Creek	8.63	6.60	23.48	75	63.95	0	0.00	0	0.00	0	0.00
050400030805	Bucklew Run-Killbuck Creek	6.07	5.50	9.42	96	72.77	0	0.00	0	0.00	0	0.00
050400030901	Mohawk Creek	4.64	2.06	55.58	65	75.04	0	0.00	0	0.00	0	0.00
050400030902	Dutch Run-Walhonding River	1.40	2.95	0.00	41	76.73	0	0.00	0	0.00	0	0.00
050400030903	Beaver Run	4.05	0.31	92.32	18	46.83	0	0.00	0	0.00	0	0.00
050400030904	Simmons Run	4.58	1.22	73.33	41	57.78	0	0.00	0	0.00	0	0.00
050400030905	Darling Run-Walhonding River	2.36	1.91	19.36	33	52.45	0	0.00	0	0.00	0	0.00
050400030906	Headwaters Mill Creek	2.69	0.68	74.77	41	45.81	0	0.00	0	0.00	0	0.00
050400030907	Spoon Creek-Mill Creek	3.29	1.45	55.99	69	44.61	0	0.00	0	0.00	0	0.00
050400030908	Crooked Creek-Walhonding River	3.23	2.72	16.00	55	64.14	0	0.00	0	0.00	0	0.00
050400040101	Headwaters Wakatomika Creek	3.06	0.93	69.46	85	49.62	0	0.00	0	0.00	0	0.00
050400040102	Winding Fork	3.22	0.77	76.11	82	60.08	0	0.00	0	0.00	0	0.00
050400040103	Brushy Fork	4.01	0.40	90.03	70	58.53	0	0.00	0	0.00	0	0.00
050400040104	Jug Run-Wakatomika Creek	1.07	0.68	36.37	71	75.27	2	83.00	2	71.00	2	57.71
050400040201	Black Run-Wakatomika Creek	9.77	1.43	85.36	135	47.97	0	0.00	0	0.00	0	0.00
050400040202	Mill Fork	4.77	2.70	43.54	110	64.21	0	0.00	0	0.00	0	0.00
050400040203	Little Wakatomika Creek	3.23	0.70	78.43	90	54.82	0	0.00	0	0.00	0	0.00
050400040204	Town of Frazeysburg-Wakatomika Creek	8.25	2.02	75.50	87	32.98	0	0.00	0	0.00	0	0.00
050400040301	Robinson Run-Muskingum River	2.25	3.12	0.00	108	58.16	0	0.00	0	0.00	0	0.00
050400040302	Village of Adams Mills-Muskingum River	3.12	5.95	0.00	63	56.61	0	0.00	0	0.00	0	0.00
050400040303	North Branch Symmes Creek	1.34	1.61	0.00	25	51.11	0	0.00	0	0.00	0	0.00
050400040304	South Branch Symmes Creek-Symmes Creek	1.03	1.31	0.00	41	68.72	0	0.00	0	0.00	0	0.00
050400040305	Blount Run-Muskingum River	1.94	1.81	6.62	149	53.10	0	0.00	0	0.00	0	0.00
050400040401	Valley Run	8.27	0.44	94.74	79	49.52	0	0.00	0	0.00	0	0.00
050400040402	Headwaters Jonathon Creek	14.44	0.77	94.70	79	41.62	0	0.00	0	0.00	0	0.00
050400040403	Turkey Run	5.08	1.03	79.66	43	61.67	0	0.00	0	0.00	0	0.00
050400040404	Buckeye Fork	3.66	0.34	90.78	39	64.44	0	0.00	0	0.00	0	0.00
050400040405	Kent Run	3.14	0.30	90.54	44	38.20	0	0.00	0	0.00	0	0.00
050400040406	Thompson Run	1.53	0.48	68.48	35	47.13	0	0.00	0	0.00	0	0.00
050400040407	Painter Creek-Jonathon Creek	5.37	0.52	90.29	163	45.29	0	0.00	0	0.00	0	0.00
050400040501	Black Fork	0.65	0.28	56.51	65	48.88	0	0.00	0	0.00	0	0.00
050400040502	Upper Moxahala Creek	3.81	1.34	64.85	111	48.75	0	0.00	0	0.00	0	0.00
050400040503	Middle Moxahala Creek	3.15	0.54	82.80	55	53.79	0	0.00	0	0.00	0	0.00
050400040504	Lower Moxahala Creek	1.90	1.64	13.45	112	52.30	0	0.00	0	0.00	0	0.00
050400040601	Little Salt Creek	2.49	0.31	87.51	29	38.02	0	0.00	0	0.00	0	0.00

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050400040602	Headwaters Salt Creek	2.00	0.41	79.56	70	54.00	0	0.00	0	0.00	0	0.00
050400040603	Buffalo Fork	0.78	0.64	18.37	41	61.10	0	0.00	0	0.00	0	0.00
050400040604	Boggs Creek	4.62	0.46	89.99	65	42.60	0	0.00	0	0.00	0	0.00
050400040605	Manns Fork Salt Creek	0.64	0.14	77.58	26	64.79	0	0.00	0	0.00	0	0.00
050400040606	Mouth Salt Creek	0.91	0.97	0.00	44	47.82	0	0.00	0	0.00	0	0.00
050400040701	Mans Fork	2.13	0.26	88.01	33	68.15	0	0.00	0	0.00	0	0.00
050400040702	Headwaters Meigs Creek	1.55	0.43	72.40	64	66.26	0	0.00	0	0.00	0	0.00
050400040703	Dyes Fork	3.32	0.62	81.20	137	61.24	0	0.00	0	0.00	0	0.00
050400040704	Fourmile Run-Meigs Creek	0.65	0.09	85.81	17	59.52	0	0.00	0	0.00	0	0.00
050400040801	Brush Creek	0.67	1.11	0.00	94	68.05	0	0.00	0	0.00	0	0.00
050400040802	Flat Run-Muskingum River	1.14	0.27	76.53	23	49.36	0	0.00	0	0.00	0	0.00
050400040803	Duncan Run-Muskingum River	0.77	0.29	61.94	28	45.56	0	0.00	0	0.00	0	0.00
050400040804	Island Run	1.08	0.04	95.84	20	68.55	0	0.00	0	0.00	0	0.00
050400040805	Blue Rock Creek-Muskingum River	0.75	0.73	2.12	40	35.19	0	0.00	0	0.00	0	0.00
050400040806	Oilspring Run-Muskingum River	1.20	0.48	59.59	27	27.38	0	0.00	0	0.00	0	0.00
050400040807	Bald Eagle Run	0.35	0.60	0.00	10	47.64	0	0.00	0	0.00	0	0.00
050400040808	Bell Creek-Muskingum River	0.44	0.15	65.13	19	30.18	0	0.00	0	0.00	0	0.00
050400040809	Olney Run-Muskingum River	0.47	0.16	66.49	13	43.72	0	0.00	0	0.00	0	0.00
050400040901	South West Branch Wolf Creek	0.70	1.16	0.00	40	57.06	0	0.00	0	0.00	0	0.00
050400040902	Headwaters South Branch Wolf Creek	0.99	0.50	49.07	62	59.99	0	0.00	0	0.00	0	0.00
050400040903	Plumb Run-South Branch Wolf Creek	0.64	0.28	56.47	22	50.56	0	0.00	0	0.00	0	0.00
050400041001	Headwaters West Branch Wolf Creek	1.53	0.33	78.11	80	50.85	0	0.00	0	0.00	0	0.00
050400041002	Aldridge Run-West Branch Wolf Creek	0.47	0.45	4.00	48	60.06	0	0.00	0	0.00	0	0.00
050400041003	Coal Run	0.50	0.20	59.59	32	61.94	0	0.00	0	0.00	0	0.00
050400041004	Hayward Run-Wolf Creek	0.54	0.51	4.50	66	57.15	0	0.00	0	0.00	0	0.00
050400041101	Headwaters Olive Green Creek	0.82	0.10	87.29	15	60.93	0	0.00	0	0.00	0	0.00
050400041102	Keith Fork	0.92	0.02	97.68	11	70.09	0	0.00	0	0.00	0	0.00
050400041103	Little Olive Green Creek	0.46	0.03	93.63	7	58.57	0	0.00	0	0.00	0	0.00
050400041104	Reasoners Run-Olive Green Creek	0.51	0.23	55.36	9	69.43	0	0.00	0	0.00	0	0.00
050400041105	Congress Run-Muskingum River	0.94	0.15	83.87	21	27.45	0	0.00	0	0.00	0	0.00
050400041201	Big Run	0.91	0.10	89.04	33	69.73	0	0.00	0	0.00	0	0.00
050400041202	Rainbow Creek	0.49	0.10	80.33	23	32.77	0	0.00	0	0.00	0	0.00
050400041203	Cat Creek-Muskingum River	0.94	0.17	81.77	46	31.99	0	0.00	0	0.00	0	0.00
050400041204	Devol Run-Muskingum River	0.93	0.14	84.60	20	28.69	0	0.00	0	0.00	0	0.00
050400050101	Headwaters Seneca Fork	0.77	0.11	85.08	35	59.24	0	0.00	0	0.00	0	0.00
050400050102	Beaver Creek	1.43	0.69	51.82	50	56.82	0	0.00	0	0.00	0	0.00
050400050103	Glady Run-Seneca Fork	0.89	0.36	60.02	46	57.28	0	0.00	0	0.00	0	0.00
050400050104	Depue Run-Seneca Fork	1.08	0.40	62.62	24	54.62	0	0.00	0	0.00	0	0.00
050400050105	Opossum Run-Seneca Fork	1.90	2.68	0.00	103	55.81	0	0.00	0	0.00	0	0.00

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050400050201	Yoker Creek	2.13	2.56	0.00	106	63.16	0	0.00	0	0.00	0	0.00
050400050202	Headwaters Collins Fork	2.18	1.28	41.04	136	56.90	0	0.00	0	0.00	0	0.00
050400050203	South Fork Buffalo Creek-Buffalo Creek	1.66	1.35	18.93	44	56.74	0	0.00	0	0.00	0	0.00
050400050204	North Fork Buffalo Creek-Buffalo Creek	2.14	1.24	42.15	78	47.24	0	0.00	0	0.00	0	0.00
050400050205	Crane Run-Buffalo Fork	2.93	3.66	0.00	72	61.70	0	0.00	0	0.00	0	0.00
050400050206	Chapman Run	1.31	2.31	0.00	74	45.38	0	0.00	0	0.00	0	0.00
050400050207	Trail Run-Wills Creek	3.39	7.26	0.00	155	37.35	0	0.00	0	0.00	0	0.00
050400050301	Headwaters Leatherwood Creek	2.32	1.70	26.63	141	54.54	0	0.00	0	0.00	0	0.00
050400050302	Hawkins Run-Leatherwood Creek	2.27	4.33	0.00	178	57.27	0	0.00	0	0.00	0	0.00
050400050401	Brushy Fork	2.13	1.80	15.61	44	59.80	0	0.00	0	0.00	0	0.00
050400050402	Headwaters Salt Fork	2.44	3.37	0.00	171	72.84	0	0.00	0	0.00	0	0.00
050400050403	Clear Fork	1.08	2.86	0.00	29	72.83	0	0.00	0	0.00	0	0.00
050400050404	Rocky Fork	0.50	2.64	0.00	57	76.67	0	0.00	0	0.00	0	0.00
050400050405	Salt Fork Lake-Sugartree Fork	0.64	1.09	0.00	51	64.92	0	0.00	0	0.00	0	0.00
050400050406	Beeham Run-Salt Fork	0.53	1.34	0.00	35	59.95	0	0.00	0	0.00	0	0.00
050400050501	North Crooked Creek	1.25	1.06	15.40	53	38.92	0	0.00	0	0.00	0	0.00
050400050502	Headwaters Crooked Creek	1.21	1.91	0.00	43	43.30	0	0.00	0	0.00	0	0.00
050400050503	Peters Creek-Crooked Creek	1.41	2.76	0.00	86	52.04	0	0.00	0	0.00	0	0.00
050400050504	Sarchet Run-Wills Creek	1.37	2.66	0.00	56	54.66	0	0.00	0	0.00	0	0.00
050400050505	Indian Camp Run	2.38	3.45	0.00	31	66.70	0	0.00	0	0.00	0	0.00
050400050506	Headwaters Birds Run	0.46	1.01	0.00	31	69.72	0	0.00	0	0.00	0	0.00
050400050507	Johnson Fork-Birds Run	0.65	1.58	0.00	40	66.84	0	0.00	0	0.00	0	0.00
050400050508	Wolf Run-Wills Creek	1.29	2.62	0.00	65	66.70	0	0.00	0	0.00	0	0.00
050400050601	Bacon Run	3.88	2.81	27.64	55	64.28	0	0.00	0	0.00	0	0.00
050400050602	Twomile Run-Wills Creek	3.73	3.51	5.82	97	47.70	0	0.00	0	0.00	0	0.00
050400050603	White Eyes Creek	2.98	2.06	30.90	80	66.91	0	0.00	0	0.00	0	0.00
050400050604	Wills Creek Dam-Wills Creek	5.71	7.22	0.00	123	69.80	4	37.75	4	38.50	0	0.00
050400050605	Mouth Wills Creek	1.15	1.41	0.00	37	62.82	0	0.00	0	0.00	0	0.00
050400060101	Otter Fork Licking River	28.29	1.18	95.81	181	39.37	0	0.00	0	0.00	0	0.00
050400060102	Headwaters North Fork Licking River	22.81	2.00	91.24	292	45.27	0	0.00	0	0.00	0	0.00
050400060103	Sycamore Creek	19.79	1.91	90.35	193	52.10	0	0.00	0	0.00	0	0.00
050400060104	Vance Creek-North Fork Licking River	26.00	2.22	91.48	181	52.93	0	0.00	0	0.00	0	0.00
050400060201	Lake Fork Licking River	21.93	2.13	90.30	342	52.40	0	0.00	0	0.00	0	0.00
050400060202	Clear Fork Licking River	10.55	0.63	94.04	91	58.77	0	0.00	0	0.00	0	0.00
050400060203	Dog Hollow Run-North Fork Licking River	5.27	0.47	91.09	60	44.13	0	0.00	0	0.00	0	0.00
050400060204	Dry Creek	8.99	0.63	93.04	86	34.58	0	0.00	0	0.00	0	0.00
050400060205	Log Pond Run-North Fork Licking River	7.35	0.72	90.15	37	37.65	0	0.00	0	0.00	0	0.00
050400060301	Headwaters Raccoon Creek	28.41	0.60	97.90	148	33.24	0	0.00	0	0.00	0	0.00
050400060302	Lobdell Creek	22.54	0.58	97.42	101	38.02	0	0.00	0	0.00	0	0.00

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050400060303	Moots Run-Raccoon Creek	16.21	0.77	95.26	171	41.10	0	0.00	0	0.00	0	0.00
050400060304	Salt Run-Raccoon Creek	6.80	0.48	92.99	69	37.03	0	0.00	0	0.00	0	0.00
050400060401	Muddy Fork	39.89	1.27	96.83	122	38.88	0	0.00	0	0.00	0	0.00
050400060402	Headwaters South Fork Licking River	19.33	0.81	95.80	96	48.20	0	0.00	0	0.00	0	0.00
050400060403	Buckeye Lake	18.42	1.00	94.60	119	28.98	0	0.00	0	0.00	0	0.00
050400060404	Buckeye Lake Reservoir Feeder	29.71	0.62	97.90	45	35.00	0	0.00	0	0.00	0	0.00
050400060405	Town of Kirkersville-South Fork Licking River	24.61	1.29	94.74	118	46.73	0	0.00	0	0.00	0	0.00
050400060406	Bell Run-South Fork Licking River	33.86	0.82	97.58	97	34.64	1	54.50	0	0.00	0	0.00
050400060407	Ramp Creek	11.56	0.27	97.69	38	44.66	0	0.00	0	0.00	0	0.00
050400060408	Dutch Fork	19.27	0.62	96.78	49	39.29	0	0.00	0	0.00	0	0.00
050400060409	Beaver Run-South Fork Licking River	20.28	1.25	93.84	115	46.08	0	0.00	0	0.00	0	0.00
050400060501	Claylick Creek	3.63	0.21	94.11	14	38.30	0	0.00	0	0.00	0	0.00
050400060502	Lost Run	4.72	0.50	89.48	47	41.68	0	0.00	0	0.00	0	0.00
050400060503	Rocky Fork	3.93	0.43	88.96	63	51.98	0	0.00	0	0.00	0	0.00
050400060504	Bowling Green Run-Licking River	5.83	1.38	76.30	78	45.00	0	0.00	0	0.00	0	0.00
050400060601	Brushy Fork	2.61	0.25	90.43	23	63.60	0	0.00	0	0.00	0	0.00
050400060602	Big Run	8.05	1.71	78.75	66	54.21	0	0.00	0	0.00	0	0.00
050400060603	Dillon Lake-Licking River	3.26	5.17	0.00	157	49.89	0	0.00	0	0.00	0	0.00
050400060604	Timber Run-Licking River	4.01	0.51	87.32	48	47.80	0	0.00	0	0.00	0	0.00
050600010101	Cottonwood Ditch	54.58	0.55	98.99	49	33.26	0	0.00	0	0.00	0	0.00
050600010102	Headwaters Scioto River	50.58	1.74	96.56	407	45.10	0	0.00	0	0.00	0	0.00
050600010103	Taylor Creek	22.61	2.89	87.22	168	56.07	1	73.00	2	63.50	1	72.02
050600010104	Silver Creek-Scioto River	36.43	1.39	96.18	183	47.55	0	0.00	0	0.00	0	0.00
050600010201	Headwaters Rush Creek	29.32	1.87	93.61	491	50.30	0	0.00	0	0.00	0	0.00
050600010202	McDonald Creek	33.67	0.53	98.42	45	37.81	0	0.00	0	0.00	0	0.00
050600010203	Dudley Run-Rush Creek	34.19	1.00	97.09	168	41.14	0	0.00	0	0.00	0	0.00
050600010301	Rock Fork	50.36	0.57	98.87	121	39.80	0	0.00	0	0.00	0	0.00
050600010302	Headwaters Little Scioto River	49.69	1.02	97.94	201	42.37	0	0.00	0	0.00	0	0.00
050600010303	City of Marion-Little Scioto River	45.74	3.81	91.67	150	32.91	0	0.00	0	0.00	0	0.00
050600010304	Honey Creek-Little Scioto River	35.29	1.17	96.68	167	31.40	0	0.00	0	0.00	0	0.00
050600010401	Gander Run-Scioto River	27.65	1.28	95.36	83	43.59	0	0.00	0	0.00	0	0.00
050600010402	Panther Creek	34.80	2.40	93.11	156	52.53	0	0.00	0	0.00	0	0.00
050600010403	Wolf Creek-Scioto River	29.94	2.44	91.84	159	58.48	5	63.20	4	51.75	2	49.90
050600010404	Wildcat Creek	31.30	1.52	95.13	98	57.00	0	0.00	0	0.00	0	0.00
050600010405	Town of La Rue-Scioto River	27.70	1.86	93.30	149	35.06	1	40.00	1	44.00	1	17.23
050600010406	Glade Run-Scioto River	48.86	6.52	86.65	293	45.44	2	48.75	2	46.50	2	35.90
050600010501	Patton Run	39.62	0.46	98.84	68	37.38	0	0.00	0	0.00	0	0.00
050600010502	Davids Run-Scioto River	22.12	0.26	98.84	57	32.41	0	0.00	0	0.00	0	0.00
050600010503	Kebler Run	38.33	0.28	99.27	42	51.39	0	0.00	0	0.00	0	0.00

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050600010504	Fulton Creek	38.50	0.49	98.73	204	42.78	0	0.00	0	0.00	0	0.00
050600010505	Ottawa Creek-Scioto River	37.40	0.31	99.16	139	41.41	0	0.00	0	0.00	0	0.00
050600010601	Upper Mill Creek	19.44	2.49	87.21	183	55.96	0	0.00	0	0.00	0	0.00
050600010602	Middle Mill Creek	25.17	1.04	95.88	433	46.72	0	0.00	0	0.00	0	0.00
050600010603	Blues Creek	32.21	1.15	96.42	236	40.06	0	0.00	0	0.00	0	0.00
050600010604	Lower Mill Creek	27.49	0.51	98.14	227	42.53	0	0.00	0	0.00	0	0.00
050600010701	Headwaters Bokes Creek	43.09	0.98	97.73	199	45.62	0	0.00	0	0.00	0	0.00
050600010702	Brush Run-Bokes Creek	25.71	1.83	92.87	123	44.15	0	0.00	0	0.00	0	0.00
050600010703	Smith Run-Bokes Creek	34.48	0.92	97.34	178	43.05	0	0.00	0	0.00	0	0.00
050600010704	Moors Run-Scioto River	21.42	0.47	97.82	94	45.45	0	0.00	0	0.00	0	0.00
050600010801	Headwaters Olentangy River	25.67	1.50	94.15	298	47.52	0	0.00	0	0.00	0	0.00
050600010802	Mud Run	55.64	1.53	97.25	130	40.69	0	0.00	0	0.00	0	0.00
050600010803	Flat Run	23.45	1.30	94.47	317	49.49	0	0.00	0	0.00	0	0.00
050600010804	Town of Caledonia-Olentangy River	32.05	3.36	89.51	260	61.20	0	0.00	0	0.00	0	0.00
050600010901	Shaw Creek	28.24	1.13	96.00	259	48.67	0	0.00	0	0.00	0	0.00
050600010902	Headwaters Whetstone Creek	13.89	1.21	91.26	476	52.84	0	0.00	0	0.00	0	0.00
050600010903	Claypool Run-Whetstone Creek	32.18	0.83	97.41	123	51.50	0	0.00	0	0.00	0	0.00
050600011001	Otter Creek-Olentangy River	47.80	1.81	96.21	292	39.56	0	0.00	0	0.00	0	0.00
050600011002	Grave Creek	54.75	0.90	98.36	180	35.61	0	0.00	0	0.00	0	0.00
050600011003	Beaver Run-Olentangy River	34.59	1.65	95.24	262	50.68	0	0.00	0	0.00	0	0.00
050600011004	Qu Qua Creek	30.91	0.87	97.17	95	44.49	0	0.00	0	0.00	0	0.00
050600011005	Brandige Run-Olentangy River	35.74	0.82	97.70	153	55.61	1	61.50	1	67.00	1	64.89
050600011006	Indian Run-Olentangy River	36.71	2.52	93.14	132	51.88	9	59.17	4	58.50	4	64.74
050600011007	Delaware Run-Olentangy River	33.18	0.34	98.97	123	51.52	0	0.00	0	0.00	0	0.00
050600011101	Deep Run-Olentangy River	22.90	0.29	98.72	166	32.35	1	45.00	1	37.00	1	43.05
050600011102	Rush Run-Olentangy River	13.99	0.34	97.56	70	34.91	7	46.00	6	29.50	5	31.47
050600011103	Mouth Olentangy River	7.33	0.13	98.26	36	9.89	2	36.00	2	23.50	2	21.39
050600011201	Eversole Run	20.47	0.23	98.88	50	29.79	3	45.33	0	0.00	0	0.00
050600011202	O'Shaughnessy Dam-Scioto River	12.81	0.52	95.92	57	29.46	4	57.25	1	87.00	1	80.16
050600011203	Indian Run	36.36	0.75	97.93	44	23.14	6	42.58	1	46.00	1	42.47
050600011204	Hayden Run-Scioto River	22.50	0.18	99.19	82	19.55	13	41.19	3	54.67	3	63.61
050600011205	Dry Run-Scioto River	11.86	0.22	98.18	22	12.30	1	71.00	1	39.00	1	50.39
050600011301	Culver Creek	30.28	1.87	93.83	165	54.39	0	0.00	0	0.00	0	0.00
050600011302	Headwaters Big Walnut Creek	17.33	1.38	92.06	515	55.91	2	81.00	2	80.50	2	85.11
050600011303	Rattlesnake Creek	32.56	0.55	98.32	92	50.99	0	0.00	0	0.00	0	0.00
050600011304	Perfect Creek-Big Walnut Creek	32.83	1.06	96.79	80	47.51	0	0.00	0	0.00	0	0.00
050600011305	Little Walnut Creek	22.09	0.86	96.10	179	45.05	0	0.00	0	0.00	0	0.00
050600011306	Prairie Run-Big Walnut Creek	25.06	1.80	92.84	53	44.60	0	0.00	0	0.00	0	0.00
050600011307	Duncan Run	38.13	0.56	98.53	78	37.70	0	0.00	0	0.00	0	0.00

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050600011308	Hoover Reservoir-Big Walnut Creek	24.59	1.45	94.09	161	34.12	1	49.00	1	60.00	1	58.42
050600011401	West Branch Alum Creek	32.56	0.72	97.78	188	52.78	0	0.00	0	0.00	0	0.00
050600011402	Headwaters Alum Creek	12.32	0.65	94.75	217	45.88	0	0.00	0	0.00	0	0.00
050600011403	Big Run-Alum Creek	28.50	1.05	96.30	107	60.40	0	0.00	0	0.00	0	0.00
050600011404	Alum Creek Dam-Alum Creek	14.96	0.57	96.18	94	45.78	5	65.50	2	72.00	2	67.74
050600011501	Rocky Fork Creek	30.18	0.52	98.29	106	38.21	5	67.90	5	48.80	4	58.48
050600011502	City of Gahanna-Big Walnut Creek	21.21	0.46	97.84	55	35.49	5	50.20	5	49.20	5	41.92
050600011503	Headwaters Blacklick Creek	27.22	0.80	97.05	194	38.28	1	26.00	1	23.00	1	10.68
050600011504	Town of Brice-Blacklick Creek	18.74	0.64	96.59	54	10.64	0	0.00	0	0.00	0	0.00
050600011505	Mason Run-Big Walnut Cr.	13.68	0.44	96.76	103	26.83	6	46.92	6	42.83	6	40.90
050600011601	Westerville Reservoir-Alum Creek	16.07	0.28	98.23	74	18.04	2	51.50	2	47.00	2	33.75
050600011602	Bliss Run-Alum Creek	13.69	0.27	98.00	96	20.82	12	48.75	12	37.92	12	32.58
050600011603	Town of Lockbourne-Alum Creek	13.79	0.60	95.65	103	28.23	5	41.10	5	34.40	5	37.85
050600011701	Pawpaw Creek	23.35	0.96	95.90	68	45.71	3	52.00	3	37.00	1	59.21
050600011702	Headwaters Walnut Creek	22.63	0.21	99.07	56	31.28	0	0.00	0	0.00	0	0.00
050600011703	Poplar Creek	23.76	0.56	97.66	60	35.20	1	17.50	1	6.00	1	8.25
050600011704	Sycamore Creek	25.65	1.08	95.78	96	42.95	0	0.00	0	0.00	0	0.00
050600011705	Town of Carroll-Walnut Creek	21.36	0.79	96.28	112	28.47	4	35.00	4	25.25	3	23.14
050600011801	Georges Creek	27.05	2.68	90.11	80	15.13	0	0.00	0	0.00	0	0.00
050600011802	Tussing Ditch-Walnut Creek	16.92	1.01	94.06	75	21.59	0	0.00	0	0.00	0	0.00
050600011803	Turkey Run	18.65	0.05	99.73	5	37.20	0	0.00	0	0.00	0	0.00
050600011804	Little Walnut Creek	24.93	0.30	98.80	71	33.56	0	0.00	0	0.00	0	0.00
050600011805	Big Run-Walnut Creek	19.57	0.69	96.49	263	29.91	7	55.57	7	55.00	6	43.09
050600011806	Mud Run-Walnut Creek	19.38	0.41	97.87	61	29.62	0	0.00	0	0.00	0	0.00
050600011901	Headwaters Big Darby Creek	30.24	4.07	86.53	216	44.70	0	0.00	0	0.00	0	0.00
050600011902	Spain Creek-Big Darby Creek	32.38	1.61	95.03	494	39.82	1	70.00	1	56.00	1	71.45
050600011903	Buck Run	27.34	0.64	97.67	211	44.71	0	0.00	0	0.00	0	0.00
050600011904	Sugar Run	33.77	0.25	99.26	66	52.01	0	0.00	0	0.00	0	0.00
050600011905	Robinson Run-Big Darby Creek	40.91	0.59	98.56	199	42.15	0	0.00	0	0.00	0	0.00
050600012001	Headwaters Treacle Creek	36.68	1.83	95.02	195	35.18	0	0.00	0	0.00	0	0.00
050600012002	Proctor Run-Treacle Creek	45.27	2.59	94.29	168	34.95	0	0.00	0	0.00	0	0.00
050600012003	Headwaters Little Darby Creek	34.52	2.82	91.84	262	29.89	0	0.00	0	0.00	0	0.00
050600012004	Spring Fork	37.80	0.71	98.11	165	41.58	1	59.00	1	47.00	0	0.00
050600012005	Barron Creek-Little Darby Creek	48.72	0.47	99.03	128	39.57	0	0.00	0	0.00	0	0.00
050600012006	Thomas Ditch-Little Darby Creek	34.73	0.81	97.67	98	46.31	3	72.33	3	74.67	3	75.47
050600012101	Worthington Ditch-Big Darby Creek	48.25	0.49	98.98	181	40.99	0	0.00	0	0.00	0	0.00
050600012102	Silver Ditch-Big Darby Creek	31.84	1.12	96.48	32	51.93	0	0.00	0	0.00	0	0.00
050600012201	Hellbranch Run	41.35	1.16	97.21	180	26.61	5	20.30	5	8.80	2	14.19
050600012202	Gay Run-Big Darby Creek	21.52	0.74	96.57	59	43.31	1	37.50	1	19.00	0	0.00

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050600012203	Greenbrier Creek-Big Darby Creek	20.44	0.36	98.23	60	39.36	0	0.00	0	0.00	0	0.00
050600012204	Lizard Run-Big Darby Creek	14.50	2.25	84.46	59	60.01	0	0.00	0	0.00	0	0.00
050600012301	Scioto Big Run	17.70	0.11	99.40	21	8.54	11	31.86	1	10.00	1	28.74
050600012302	Kian Run-Scioto River	5.26	0.18	96.65	20	13.85	1	29.00	1	23.00	1	7.25
050600012303	Grant Run-Scioto River	21.74	0.17	99.20	52	18.93	4	31.88	0	0.00	0	0.00
050600012304	Grove Run-Scioto River	24.70	0.83	96.66	178	35.51	12	39.79	2	37.00	2	38.76
050600012305	Dry Run	19.60	0.68	96.55	74	35.98	6	31.58	3	21.00	3	25.18
050600012306	Town of Circleville-Scioto River	10.38	1.14	88.97	67	46.03	5	44.00	2	22.00	2	34.71
050600020101	Headwaters Deer Creek	30.14	1.47	95.13	98	38.54	2	40.75	2	27.00	0	0.00
050600020102	Richmond Ditch-Deer Creek	36.23	0.24	99.35	62	33.11	0	0.00	0	0.00	0	0.00
050600020103	Glade Run	44.57	0.53	98.82	61	36.52	0	0.00	0	0.00	0	0.00
050600020104	Walnut Run	41.56	0.31	99.25	31	28.28	0	0.00	0	0.00	0	0.00
050600020105	Oak Run	35.75	0.41	98.86	48	27.58	0	0.00	0	0.00	0	0.00
050600020106	Turkey Run-Deer Creek	26.43	0.43	98.38	86	37.89	0	0.00	0	0.00	0	0.00
050600020201	South Fork Bradford Creek-Bradford Creek	44.27	0.20	99.54	47	37.23	0	0.00	0	0.00	0	0.00
050600020202	Sugar Run	43.66	0.34	99.22	52	46.87	0	0.00	0	0.00	0	0.00
050600020203	Opossum Run	40.29	0.35	99.14	43	45.24	0	0.00	0	0.00	0	0.00
050600020204	Town of Mount Sterling-Deer Creek	31.34	1.09	96.52	71	48.58	0	0.00	0	0.00	0	0.00
050600020205	Deer Creek Lake-Deer Creek	34.61	0.75	97.83	51	43.26	0	0.00	0	0.00	0	0.00
050600020206	Buskirk Creek	44.91	0.23	99.48	40	35.51	0	0.00	0	0.00	0	0.00
050600020207	Dear Creek Dam-Deer Creek	27.66	0.24	99.12	21	49.76	0	0.00	0	0.00	0	0.00
050600020301	Dry Run	40.12	0.21	99.47	38	38.85	0	0.00	0	0.00	0	0.00
050600020302	Hay Run	34.09	0.15	99.56	58	30.71	0	0.00	0	0.00	0	0.00
050600020303	Waugh Creek	25.86	0.13	99.48	27	29.13	0	0.00	0	0.00	0	0.00
050600020304	State Run-Deer Creek	14.75	0.31	97.89	56	35.81	0	0.00	0	0.00	0	0.00
050600020401	Hargus Creek	10.43	0.23	97.82	42	24.77	0	0.00	0	0.00	0	0.00
050600020402	Yellowbud Creek	35.30	0.44	98.75	82	35.24	0	0.00	0	0.00	0	0.00
050600020403	Lick Run-Scioto River	18.31	0.80	95.64	78	37.65	2	68.00	2	62.50	1	63.31
050600020404	Congo Creek	24.26	0.82	96.64	46	42.70	0	0.00	0	0.00	0	0.00
050600020405	Scippo Creek	13.31	0.16	98.83	46	39.45	0	0.00	0	0.00	0	0.00
050600020406	Blackwater Creek-Scioto River	13.73	2.90	78.86	103	46.60	0	0.00	0	0.00	0	0.00
050600020501	Kinnikinnick Creek	15.82	1.68	89.36	146	45.06	1	66.00	1	67.00	1	80.93
050600020502	Dry Run-Scioto River	7.34	2.95	59.85	76	38.71	0	0.00	0	0.00	0	0.00
050600020503	Lick Run-Scioto River	1.70	3.45	0.00	112	31.24	0	0.00	0	0.00	0	0.00
050600020601	Beech Fork	22.45	1.83	91.84	70	45.09	0	0.00	0	0.00	0	0.00
050600020602	Headwaters Salt Creek	12.97	0.16	98.73	26	28.98	0	0.00	0	0.00	0	0.00
050600020603	Laurel Run	1.67	0.20	88.28	45	52.19	0	0.00	0	0.00	0	0.00
050600020604	Pine Creek	0.44	0.92	0.00	88	75.12	0	0.00	0	0.00	0	0.00
050600020605	Blue Creek-Salt Creek	1.67	0.48	71.43	75	45.50	0	0.00	0	0.00	0	0.00

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050600020701	Pigeon Creek	0.46	1.14	0.00	153	62.75	0	0.00	0	0.00	0	0.00
050600020702	Middle Fork Salt Creek	0.48	0.89	0.00	170	64.38	0	0.00	0	0.00	0	0.00
050600020801	Headwaters Little Salt Creek	7.31	2.39	67.27	115	62.46	0	0.00	0	0.00	0	0.00
050600020802	Buckeye Creek	2.26	2.18	3.24	101	63.40	0	0.00	0	0.00	0	0.00
050600020803	Horse Creek-Little Salt Creek	1.51	1.91	0.00	78	43.89	0	0.00	0	0.00	0	0.00
050600020804	Pigeon Creek	0.37	1.24	0.00	101	62.85	0	0.00	0	0.00	0	0.00
050600020805	Sour Run-Little Salt Creek	0.49	1.12	0.00	136	59.09	0	0.00	0	0.00	0	0.00
050600020901	East Fork Queer Creek	0.23	0.12	44.82	12	79.68	0	0.00	0	0.00	0	0.00
050600020902	Queer Creek	0.39	0.63	0.00	60	67.12	0	0.00	0	0.00	0	0.00
050600020903	Pretty Run	0.36	0.36	1.96	24	61.61	0	0.00	0	0.00	0	0.00
050600020904	Pike Run	0.26	0.50	0.00	39	60.44	0	0.00	0	0.00	0	0.00
050600020905	Village of Eagle Mills-Salt Creek	0.16	1.22	0.00	52	64.80	0	0.00	0	0.00	0	0.00
050600020906	Poe Run-Salt Creek	0.67	1.08	0.00	140	55.15	0	0.00	0	0.00	0	0.00
050600021001	Indian Creek	0.16	0.19	0.00	37	51.23	0	0.00	0	0.00	0	0.00
050600021002	Dry Run	0.42	1.33	0.00	52	40.79	0	0.00	0	0.00	0	0.00
050600021003	Headwaters Walnut Creek	0.69	1.16	0.00	93	54.27	0	0.00	0	0.00	0	0.00
050600021004	Lick Run-Walnut Creek	1.27	1.77	0.00	129	53.59	0	0.00	0	0.00	0	0.00
050600021005	Stony Creek-Scioto River	0.67	2.92	0.00	103	47.35	0	0.00	0	0.00	0	0.00
050600021101	Carrs Run	0.08	0.67	0.00	31	72.36	0	0.00	0	0.00	0	0.00
050600021102	Left Fork Crooked Creek	0.03	0.11	0.00	16	54.39	0	0.00	0	0.00	0	0.00
050600021103	Crooked Creek	0.60	0.88	0.00	81	48.64	0	0.00	0	0.00	0	0.00
050600021104	Pee Pee Creek	0.03	0.16	0.00	43	50.96	0	0.00	0	0.00	0	0.00
050600021105	Meadow Run-Scioto River	2.15	2.37	0.00	245	46.57	0	0.00	0	0.00	0	0.00
050600021201	Headwaters Sunfish Creek	0.22	0.08	63.24	18	69.32	0	0.00	0	0.00	0	0.00
050600021202	Headwaters Morgan Fork	0.01	0.23	0.00	10	65.51	0	0.00	0	0.00	0	0.00
050600021203	Left Fork Morgan Fork-Morgan Fork	0.19	0.02	88.75	5	34.10	0	0.00	0	0.00	0	0.00
050600021204	Grassy Fork-Sunfish Creek	0.46	0.05	89.39	12	47.03	0	0.00	0	0.00	0	0.00
050600021205	Chenoweth Fork	0.01	0.07	0.00	14	50.06	0	0.00	0	0.00	0	0.00
050600021206	Leeth Creek-Sunfish Creek	0.36	0.15	59.48	30	60.07	0	0.00	0	0.00	0	0.00
050600021301	No Name Creek	0.02	0.04	0.00	16	49.77	0	0.00	0	0.00	0	0.00
050600021302	Headwaters Big Beaver Creek	0.84	1.86	0.00	163	51.45	0	0.00	0	0.00	0	0.00
050600021303	Little Beaver Creek-Big Beaver Creek	1.90	2.16	0.00	194	52.73	0	0.00	0	0.00	0	0.00
050600021304	Boswell Run-Scioto River	0.01	1.64	0.00	78	40.54	0	0.00	0	0.00	0	0.00
050600021401	Churn Creek	0.33	0.03	90.25	7	44.28	0	0.00	0	0.00	0	0.00
050600021402	Mill Creek	0.58	0.09	84.79	27	77.15	0	0.00	0	0.00	0	0.00
050600021403	Turkey Creek	0.58	0.20	65.57	53	61.19	0	0.00	0	0.00	0	0.00
050600021404	Turkey Run-South Fork Scioto Brush Creek	0.76	0.13	82.66	48	40.82	0	0.00	0	0.00	0	0.00
050600021405	Rocky Fork	0.00	0.00	0.00	4	60.53	0	0.00	0	0.00	0	0.00
050600021406	Beech Fork-South Fork Scioto Brush Creek	0.03	0.44	0.00	51	51.31	0	0.00	0	0.00	0	0.00

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050600021501	Headwaters Scioto Brush Creek	1.62	0.28	82.61	134	58.04	0	0.00	0	0.00	0	0.00
050600021502	Rarden Creek	0.00	0.21	0.00	19	46.19	0	0.00	0	0.00	0	0.00
050600021503	Jaybird Branch-Scioto Brush Creek	1.44	0.37	74.19	55	60.90	0	0.00	0	0.00	0	0.00
050600021504	Dunlap Creek-Scioto Brush Creek	0.35	0.24	32.87	99	45.07	0	0.00	0	0.00	0	0.00
050600021505	Bear Creek	0.00	0.01	0.00	1	74.00	0	0.00	0	0.00	0	0.00
050600021506	McCullough Creek	0.02	0.05	0.00	12	57.15	0	0.00	0	0.00	0	0.00
050600021507	Duck Run-Scioto Brush Creek	0.06	0.28	0.00	48	56.58	0	0.00	0	0.00	0	0.00
050600021601	Camp Creek	0.02	0.08	0.00	28	67.30	0	0.00	0	0.00	0	0.00
050600021602	Big Run-Scioto River	0.15	0.52	0.00	67	39.94	0	0.00	0	0.00	0	0.00
050600021603	Bear Creek-Scioto River	0.70	1.05	0.00	137	32.01	0	0.00	0	0.00	0	0.00
050600021604	Pond Creek	0.03	0.44	0.00	82	18.04	0	0.00	0	0.00	0	0.00
050600021605	Carroll Run-Scioto River	0.35	8.09	0.00	258	22.54	0	0.00	0	0.00	0	0.00
050600030101	Headwaters Paint Creek	45.58	0.34	99.25	43	49.80	0	0.00	0	0.00	0	0.00
050600030102	East Fork Paint Creek	55.80	0.23	99.59	87	36.88	0	0.00	0	0.00	0	0.00
050600030103	Town of Washington Court House-Paint Creek	44.87	0.75	98.32	83	33.37	0	0.00	0	0.00	0	0.00
050600030201	Headwaters Sugar Creek	49.67	0.40	99.19	75	32.39	0	0.00	0	0.00	0	0.00
050600030202	Camp Run-Sugar Creek	51.06	0.58	98.86	58	50.43	0	0.00	0	0.00	0	0.00
050600030301	Wilson Creek	43.26	0.39	99.11	27	38.34	0	0.00	0	0.00	0	0.00
050600030302	Grassy Branch	63.94	0.34	99.46	18	41.72	0	0.00	0	0.00	0	0.00
050600030303	West Branch Rattlesnake Creek	55.78	0.20	99.64	24	41.94	0	0.00	0	0.00	0	0.00
050600030304	Headwaters Rattlesnake Creek	55.32	0.69	98.75	91	49.41	0	0.00	0	0.00	0	0.00
050600030305	Waddle Ditch-Rattlesnake Creek	37.27	0.89	97.61	33	56.77	0	0.00	0	0.00	0	0.00
050600030401	South Fork Lees Creek	27.26	0.17	99.37	11	36.28	0	0.00	0	0.00	0	0.00
050600030402	Middle Fork Lees Creek	28.83	0.12	99.59	12	42.46	0	0.00	0	0.00	0	0.00
050600030403	Lees Creek	35.56	0.49	98.62	74	50.49	0	0.00	0	0.00	0	0.00
050600030404	Walnut Creek	11.92	0.03	99.77	12	36.25	0	0.00	0	0.00	0	0.00
050600030405	Hardin Creek	6.35	0.36	94.28	10	58.33	0	0.00	0	0.00	0	0.00
050600030406	Fall Creek	14.89	0.30	97.97	7	60.26	0	0.00	0	0.00	0	0.00
050600030407	Big Branch-Rattlesnake Creek	7.18	0.62	91.42	22	58.42	0	0.00	0	0.00	0	0.00
050600030501	South Fork Rocky Fork	2.16	0.01	99.65	3	43.21	0	0.00	0	0.00	0	0.00
050600030502	Clear Creek	4.33	0.42	90.34	54	53.76	0	0.00	0	0.00	0	0.00
050600030503	Headwaters Rocky Fork	4.81	0.64	86.68	44	60.97	0	0.00	0	0.00	0	0.00
050600030504	Rocky Fork Lake-Rocky Fork	3.19	0.15	95.36	10	50.62	0	0.00	0	0.00	0	0.00
050600030505	Franklin Branch-Rocky Fork	4.98	0.15	97.02	21	50.68	0	0.00	0	0.00	0	0.00
050600030601	Indian Creek-Paint Creek	34.62	0.27	99.23	72	43.06	0	0.00	0	0.00	0	0.00
050600030602	Farmers Run-Paint Creek	14.31	0.46	96.78	41	42.94	0	0.00	0	0.00	0	0.00
050600030603	Cliff Creek-Paint Creek	3.63	0.71	80.43	20	66.53	0	0.00	0	0.00	0	0.00
050600030701	Buckskin Creek	17.01	0.13	99.25	67	44.44	0	0.00	0	0.00	0	0.00
050600030702	Upper Twin Creek	0.28	0.16	42.38	22	71.97	0	0.00	0	0.00	0	0.00

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050600030703	Lower Twin Creek	0.81	0.38	53.40	23	76.25	0	0.00	0	0.00	0	0.00
050600030704	Sulphur Lick-Paint Creek	0.54	0.44	17.50	121	55.29	0	0.00	0	0.00	0	0.00
050600030801	Thompson Creek	43.49	0.29	99.33	18	31.92	0	0.00	0	0.00	0	0.00
050600030802	Headwaters North Fork Paint Creek	42.84	0.11	99.75	22	30.29	0	0.00	0	0.00	0	0.00
050600030803	Headwaters Compton Creek	41.71	0.57	98.63	66	38.21	0	0.00	0	0.00	0	0.00
050600030804	Mills Branch-Compton Creek	41.75	0.68	98.37	43	53.03	0	0.00	0	0.00	0	0.00
050600030805	Mud Run-North Fork Paint Creek	38.68	0.53	98.64	70	37.23	0	0.00	0	0.00	0	0.00
050600030901	Herrod Creek	27.67	0.14	99.51	25	35.45	0	0.00	0	0.00	0	0.00
050600030902	Little Creek	9.44	0.14	98.48	46	41.37	0	0.00	0	0.00	0	0.00
050600030903	Oldtown Run-North Fork Paint Creek	18.91	0.39	97.92	95	36.94	0	0.00	0	0.00	0	0.00
050600030904	Biers Run-North Fork Paint Creek	7.67	0.18	97.61	30	30.04	0	0.00	0	0.00	0	0.00
050600031001	Black Run	0.23	2.09	0.00	10	57.72	0	0.00	0	0.00	0	0.00
050600031002	Ralston Run	0.02	0.08	0.00	14	41.55	0	0.00	0	0.00	0	0.00
050600031003	City of Chillicothe-Paint Creek	1.89	1.59	16.06	114	39.85	0	0.00	0	0.00	0	0.00
050800010101	North Fork Great Miami River	36.70	2.53	93.12	170	49.78	0	0.00	0	0.00	0	0.00
050800010102	South Fork Great Miami River	28.51	1.22	95.72	226	47.33	1	19.00	1	7.00	0	0.00
050800010103	Indian Lake-Great Miami River	32.02	7.17	77.59	227	44.48	0	0.00	0	0.00	0	0.00
050800010201	Willow Creek	42.51	0.78	98.17	89	44.31	0	0.00	0	0.00	0	0.00
050800010202	Headwaters Muchnippi Creek	41.28	0.32	99.23	74	36.20	0	0.00	0	0.00	0	0.00
050800010203	Little Muchnippi Creek	36.31	1.26	96.54	229	47.86	0	0.00	0	0.00	0	0.00
050800010204	Calico Creek-Muchnippi Creek	46.04	4.31	90.64	94	58.92	0	0.00	0	0.00	0	0.00
050800010301	Cherokee Mans Run	23.07	1.19	94.83	90	35.17	0	0.00	0	0.00	0	0.00
050800010302	Rennick Creek-Great Miami River	44.50	4.58	89.70	260	42.24	0	0.00	0	0.00	0	0.00
050800010303	Rum Creek	34.77	1.23	96.45	155	48.57	0	0.00	0	0.00	0	0.00
050800010304	Blue Jacket Creek	23.79	4.89	79.44	126	32.45	0	0.00	0	0.00	0	0.00
050800010305	Bokengehalas Creek	23.09	3.71	83.94	244	44.22	0	0.00	0	0.00	0	0.00
050800010306	Brandywine Creek-Great Miami River	32.26	2.64	91.81	223	49.70	0	0.00	0	0.00	0	0.00
050800010401	McKees Creek	19.47	3.94	79.75	181	32.24	0	0.00	0	0.00	0	0.00
050800010402	Lee Creek	29.71	2.13	92.82	165	46.09	1	54.00	1	38.00	0	0.00
050800010403	Stoney Creek	26.16	2.99	88.57	168	45.11	0	0.00	0	0.00	0	0.00
050800010404	Indian Creek	35.47	1.51	95.74	72	53.40	0	0.00	0	0.00	0	0.00
050800010405	Plum Creek	20.25	0.50	97.52	183	32.47	0	0.00	0	0.00	0	0.00
050800010406	Turkeyfoot Creek-Great Miami River	19.37	0.86	95.57	208	44.54	0	0.00	0	0.00	0	0.00
050800010501	Headwaters Loramie Creek	28.68	0.62	97.85	231	37.40	0	0.00	0	0.00	0	0.00
050800010502	Mile Creek	41.55	0.18	99.58	141	37.07	0	0.00	0	0.00	0	0.00
050800010503	Lake Loramie-Loramie Creek	32.99	2.18	93.38	426	48.09	0	0.00	0	0.00	0	0.00
050800010601	Nine Mile Creek	23.88	0.88	96.33	133	37.49	0	0.00	0	0.00	0	0.00
050800010602	Painter Creek-Loramie Creek	14.11	1.00	92.89	197	35.29	0	0.00	0	0.00	0	0.00
050800010603	Turtle Creek	14.81	0.46	96.90	201	35.10	0	0.00	0	0.00	0	0.00

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050800010604	Mill Creek-Loramie Creek	11.14	1.19	89.34	205	49.94	0	0.00	0	0.00	0	0.00
050800010701	Leatherwood Creek	24.18	0.27	98.90	42	36.43	0	0.00	0	0.00	0	0.00
050800010702	Mosquito Creek	22.34	1.29	94.20	195	51.69	1	70.00	1	86.00	1	75.81
050800010703	Brush Creek-Great Miami River	14.56	0.68	95.36	120	34.66	0	0.00	0	0.00	0	0.00
050800010704	Rush Creek	19.38	0.48	97.51	55	31.39	0	0.00	0	0.00	0	0.00
050800010705	Garbry Creek-Great Miami River	15.60	0.44	97.16	96	28.86	0	0.00	0	0.00	0	0.00
050800010801	Spring Creek	18.50	0.40	97.82	93	38.52	1	68.50	1	63.00	1	58.52
050800010802	Headwaters Lost Creek	15.86	0.26	98.36	49	37.53	0	0.00	0	0.00	0	0.00
050800010803	East Branch Lost Creek	18.45	0.38	97.96	47	34.23	0	0.00	0	0.00	0	0.00
050800010804	Little Lost Creek-Lost Creek	13.44	0.24	98.23	49	35.88	0	0.00	0	0.00	0	0.00
050800010805	Peter's Creek-Great Miami River	21.77	0.46	97.91	82	27.21	0	0.00	0	0.00	0	0.00
050800010901	South Fork Stillwater River	30.86	1.06	96.56	59	44.92	0	0.00	0	0.00	0	0.00
050800010902	Headwaters Stillwater River	38.02	0.17	99.54	16	41.50	0	0.00	0	0.00	0	0.00
050800010903	North Fork Stillwater River	30.09	0.36	98.82	58	33.69	0	0.00	0	0.00	0	0.00
050800010904	Boyd Creek	23.56	0.93	96.05	90	24.29	0	0.00	0	0.00	0	0.00
050800010905	Woodington Run-Stillwater River	32.47	1.40	95.68	216	29.99	1	70.00	1	46.00	1	60.24
050800010906	Town of Beamsville-Stillwater River	19.76	0.78	96.07	152	36.87	0	0.00	0	0.00	0	0.00
050800011001	Dismal Creek	22.85	2.23	90.24	44	34.73	0	0.00	0	0.00	0	0.00
050800011002	Kraut Creek	22.28	3.03	86.42	229	46.77	0	0.00	0	0.00	0	0.00
050800011003	West Branch Greenville Creek	24.28	1.01	95.86	165	37.75	0	0.00	0	0.00	0	0.00
050800011004	Headwaters Greenville Creek	16.05	2.52	84.33	125	46.73	1	65.00	1	77.00	1	88.91
050800011101	Mud Creek	27.84	2.63	90.54	277	27.45	0	0.00	0	0.00	0	0.00
050800011102	Bridge Creek-Greenville Creek	19.17	2.01	89.52	239	23.88	0	0.00	0	0.00	0	0.00
050800011103	Dividing Branch-Greenville Creek	21.95	0.88	96.01	352	32.61	0	0.00	0	0.00	0	0.00
050800011201	Indian Creek	27.78	0.30	98.93	66	35.05	0	0.00	0	0.00	0	0.00
050800011202	Swamp Creek	27.16	0.16	99.40	95	36.22	0	0.00	0	0.00	0	0.00
050800011203	Trotters Creek	19.49	0.40	97.96	56	42.23	0	0.00	0	0.00	0	0.00
050800011204	Harris Creek	18.11	0.31	98.27	62	26.05	0	0.00	0	0.00	0	0.00
050800011205	Town of Covington-Stillwater River	11.54	0.41	96.49	73	37.94	0	0.00	0	0.00	0	0.00
050800011301	Little Painter Creek	41.74	0.15	99.63	25	28.64	0	0.00	0	0.00	0	0.00
050800011302	Painter Creek	38.44	0.61	98.41	124	29.49	0	0.00	0	0.00	0	0.00
050800011303	Canyon Run-Stillwater River	25.27	0.27	98.93	79	41.94	0	0.00	0	0.00	0	0.00
050800011401	Brush Creek	39.61	0.55	98.62	39	50.88	0	0.00	0	0.00	0	0.00
050800011402	Ludlow Creek	31.78	0.39	98.78	78	36.15	0	0.00	0	0.00	0	0.00
050800011403	Brush Creek	19.57	0.24	98.79	12	34.17	0	0.00	0	0.00	0	0.00
050800011404	Jones Run-Stillwater River	14.97	0.76	94.91	39	31.59	0	0.00	0	0.00	0	0.00
050800011405	Mill Creek-Stillwater River	16.84	0.85	94.94	45	41.09	0	0.00	0	0.00	0	0.00
050800011406	Town of Irvington-Stillwater River	7.55	0.24	96.80	32	20.64	0	0.00	0	0.00	0	0.00
050800011501	Machochee Creek	11.57	2.10	81.84	98	47.92	0	0.00	0	0.00	0	0.00

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050800011502	Headwaters Mad River	7.48	2.73	63.55	146	53.60	0	0.00	0	0.00	0	0.00
050800011503	Kings Creek	14.70	0.97	93.39	173	37.94	0	0.00	0	0.00	0	0.00
050800011504	Glady Creek-Mad River	32.67	2.65	91.87	229	35.29	1	71.00	1	83.00	1	97.53
050800011601	Muddy Creek	30.83	1.99	93.55	173	42.64	0	0.00	0	0.00	0	0.00
050800011602	Dugan Run	18.41	0.81	95.61	94	27.84	0	0.00	0	0.00	0	0.00
050800011603	Nettle Creek	11.71	0.49	95.85	69	42.78	0	0.00	0	0.00	0	0.00
050800011604	Anderson Creek	26.50	0.50	98.11	55	34.74	0	0.00	0	0.00	0	0.00
050800011605	Storms Creek	11.57	0.14	98.82	13	38.65	0	0.00	0	0.00	0	0.00
050800011606	Chapman Creek	18.98	0.92	95.14	90	40.01	0	0.00	0	0.00	0	0.00
050800011607	Bogles Run-Mad River	34.20	2.24	93.44	90	68.61	0	0.00	0	0.00	0	0.00
050800011701	East Fork Buck Creek	25.64	1.25	95.13	107	37.52	0	0.00	0	0.00	0	0.00
050800011702	Headwaters Buck Creek	18.49	1.38	92.53	153	35.68	0	0.00	0	0.00	0	0.00
050800011703	Sinking Creek	24.97	0.71	97.16	41	42.55	1	81.00	1	97.00	1	100.00
050800011704	Beaver Creek	31.11	1.00	96.78	99	36.88	0	0.00	0	0.00	0	0.00
050800011705	Clarence J Brown Lake-Buck Creek	10.38	1.53	85.24	72	39.13	1	76.00	1	86.00	1	100.00
050800011706	City of Springfield-Buck Creek	12.88	0.44	96.60	33	27.07	0	0.00	0	0.00	0	0.00
050800011801	Moore Run	18.99	0.59	96.92	62	28.62	0	0.00	0	0.00	0	0.00
050800011802	Pondy Creek-Mad River	23.77	0.72	96.98	26	29.57	0	0.00	0	0.00	0	0.00
050800011803	Mill Creek	23.80	0.88	96.31	41	26.65	0	0.00	0	0.00	0	0.00
050800011804	Donnels Creek	26.54	0.32	98.78	52	32.59	0	0.00	0	0.00	0	0.00
050800011805	Rock Run-Mad River	18.51	0.75	95.97	40	28.46	0	0.00	0	0.00	0	0.00
050800011806	Jackson Creek-Mad River	28.18	1.33	95.30	97	30.02	0	0.00	0	0.00	0	0.00
050800011901	Mud Creek	21.57	0.42	98.05	35	23.56	0	0.00	0	0.00	0	0.00
050800011902	Mud Run	21.78	0.27	98.76	31	29.35	0	0.00	0	0.00	0	0.00
050800011903	Huffman Dam-Mad River	17.79	0.28	98.44	43	19.29	0	0.00	0	0.00	0	0.00
050800011904	City of Dayton-Mad River	6.22	0.09	98.53	17	12.72	0	0.00	0	0.00	0	0.00
050800012001	East Fork Honey Creek	29.72	1.43	95.20	54	42.65	0	0.00	0	0.00	0	0.00
050800012002	West Fork Honey Creek	26.08	1.15	95.60	116	41.75	0	0.00	0	0.00	0	0.00
050800012003	Indian Creek	16.75	1.16	93.09	88	43.04	1	82.00	1	93.00	1	100.00
050800012004	Pleasant Run-Honey Creek	17.46	0.91	94.79	91	39.40	1	29.00	1	29.00	1	37.51
050800012005	Poplar Creek-Great Miami River	11.12	0.37	96.66	73	37.21	0	0.00	0	0.00	0	0.00
050800020101	North Branch Wolf Creek	24.16	0.50	97.92	53	27.37	0	0.00	0	0.00	0	0.00
050800020102	Headwaters Wolf Creek	28.14	0.28	99.00	43	32.25	0	0.00	0	0.00	0	0.00
050800020103	Dry Run-Wolf Creek	11.62	0.56	95.14	47	15.14	0	0.00	0	0.00	0	0.00
050800020104	Holes Creek	16.45	0.18	98.93	26	18.00	0	0.00	0	0.00	0	0.00
050800020105	Town of Oakwood-Great Miami River	2.05	0.23	88.56	20	9.38	0	0.00	0	0.00	0	0.00
050800020106	Opossum Creek-Great Miami River	5.28	0.18	96.65	14	21.72	0	0.00	0	0.00	0	0.00
050800020201	Millers Fork	22.76	0.33	98.54	70	30.43	0	0.00	0	0.00	0	0.00
050800020202	Headwaters Twin Creek	30.85	0.58	98.13	216	38.23	0	0.00	0	0.00	0	0.00

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050800020203	Swamp Creek	43.96	0.18	99.58	23	39.98	0	0.00	0	0.00	0	0.00
050800020204	Price Creek	28.16	0.25	99.10	71	37.57	0	0.00	0	0.00	0	0.00
050800020205	Lesley Run-Twin Creek	24.22	0.26	98.91	96	39.46	0	0.00	0	0.00	0	0.00
050800020301	Bantas Fork	23.17	0.25	98.94	81	35.96	0	0.00	0	0.00	0	0.00
050800020302	Aukerman Creek	17.88	0.21	98.84	36	28.13	0	0.00	0	0.00	0	0.00
050800020303	Toms Run	30.36	0.36	98.83	47	43.96	0	0.00	0	0.00	0	0.00
050800020304	Town of Gratis-Twin Creek	12.62	0.36	97.18	65	40.33	0	0.00	0	0.00	0	0.00
050800020305	Little Twin Creek	23.41	0.22	99.04	29	27.82	0	0.00	0	0.00	0	0.00
050800020306	Town of Germantown-Twin Creek	7.90	0.18	97.74	26	41.61	0	0.00	0	0.00	0	0.00
050800020401	Headwaters Bear Creek	29.97	0.37	98.77	53	33.50	0	0.00	0	0.00	0	0.00
050800020402	Mouth Bear Creek	17.82	0.38	97.87	41	39.94	0	0.00	0	0.00	0	0.00
050800020403	Clear Creek	10.57	0.32	97.01	99	28.45	0	0.00	0	0.00	0	0.00
050800020404	Dry Run-Great Miami River	5.88	0.34	94.20	41	33.73	0	0.00	0	0.00	0	0.00
050800020501	Headwaters Sevenmile Creek	30.04	0.39	98.70	152	33.93	0	0.00	0	0.00	0	0.00
050800020502	Paint Creek	13.99	0.18	98.68	30	40.16	0	0.00	0	0.00	0	0.00
050800020503	Beasley Run-Sevenmile Creek	13.52	0.20	98.49	59	29.54	0	0.00	0	0.00	0	0.00
050800020504	Rush Run-Sevenmile Creek	3.26	0.17	94.87	42	48.31	0	0.00	0	0.00	0	0.00
050800020505	Ninemile Creek-Sevenmile Creek	0.28	0.12	58.99	15	21.75	0	0.00	0	0.00	0	0.00
050800020601	Headwaters Four Mile Creek	21.43	0.15	99.32	39	49.90	0	0.00	0	0.00	0	0.00
050800020602	Little Four Mile Creek	31.57	0.13	99.58	13	51.41	0	0.00	0	0.00	0	0.00
050800020603	East Fork Four Mile Creek-Four Mile Creek	20.67	0.12	99.43	16	48.29	0	0.00	0	0.00	0	0.00
050800020604	Acton Lake Dam-Four Mile Creek	4.64	0.06	98.62	31	43.25	0	0.00	0	0.00	0	0.00
050800020605	Cotton Run-Four Mile Creek	0.92	0.13	85.74	40	35.73	0	0.00	0	0.00	0	0.00
050800020701	Elk Creek	8.74	0.14	98.40	71	27.07	0	0.00	0	0.00	0	0.00
050800020702	Browns Run-Great Miami River	2.15	0.13	94.17	30	21.60	0	0.00	0	0.00	0	0.00
050800020703	Shaker Creek	21.83	0.41	98.12	42	19.13	0	0.00	0	0.00	0	0.00
050800020704	Dicks Creek	9.41	0.18	98.06	28	11.11	0	0.00	0	0.00	0	0.00
050800020705	Gregory Creek	5.15	0.07	98.57	11	11.16	0	0.00	0	0.00	0	0.00
050800020706	Town of New Miami-Great Miami River	0.64	0.57	10.24	40	30.18	0	0.00	0	0.00	0	0.00
050800020802	Brandywine Creek-Indian Creek	26.38	0.00	100.00	0	0.00	0	0.00	0	0.00	0	0.00
050800020803	Beals Run-Indian Creek	1.44	0.38	73.46	56	42.04	0	0.00	0	0.00	0	0.00
050800020901	Pleasant Run	2.13	0.07	96.59	6	7.31	0	0.00	0	0.00	0	0.00
050800020902	Banklick Creek-Great Miami River	0.54	0.24	55.43	32	19.27	0	0.00	0	0.00	0	0.00
050800020903	Paddys Run	5.16	0.83	83.99	61	16.89	0	0.00	0	0.00	0	0.00
050800020904	Dry Run-Great Miami River	1.31	0.19	85.25	19	24.98	0	0.00	0	0.00	0	0.00
050800020905	Taylor Creek	1.48	0.00	99.86	2	19.94	0	0.00	0	0.00	0	0.00
050800020906	Jordan Creek-Great Miami River	1.58	0.79	50.15	33	42.46	0	0.00	0	0.00	0	0.00
050800020907	Doublelick Run-Great Miami River	2.45	2.29	6.61	22	49.21	0	0.00	0	0.00	0	0.00
050800030701	Headwaters Middle Fork East Fork Whitewater River	19.65	1.52	92.28	72	57.63	0	0.00	0	0.00	0	0.00

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050800030702	Headwaters East Fork Whitewater River	14.69	0.84	94.26	105	32.19	0	0.00	0	0.00	0	0.00
050800030703	Mud Creek-Middle Fork East Fork Whitewater River	21.06	0.27	98.70	16	28.91	0	0.00	0	0.00	0	0.00
050800030704	Rocky Fork-East Fork Whitewater River	9.33	0.03	99.66	2	26.99	0	0.00	0	0.00	0	0.00
050800030707	Short Creek-East Fork Whitewater River	0.81	0.00	100.00	0	0.00	0	0.00	0	0.00	0	0.00
050800030708	Elkhorn Creek	25.34	0.21	99.19	11	32.75	0	0.00	0	0.00	0	0.00
050800030807	Headwaters Dry Fork Whitewater River	1.19	0.00	100.00	0	0.00	0	0.00	0	0.00	0	0.00
050800030808	Howard Creek-Dry Fork Whitewater River	2.20	0.28	87.05	20	19.69	0	0.00	0	0.00	0	0.00
050800030809	Lee Creek-Dry Fork Whitewater River	2.96	0.24	91.94	10	21.22	0	0.00	0	0.00	0	0.00
050800030810	Jameson Creek-Whitewater River	1.52	1.88	0.00	40	51.66	0	0.00	0	0.00	0	0.00
050901010101	Chickamauga Creek	0.19	0.12	38.83	32	33.02	0	0.00	0	0.00	0	0.00
050901010103	Long Run-Ohio River	1.80	0.03	98.43	2	26.99	0	0.00	0	0.00	0	0.00
050901010201	East Branch Raccoon Creek	0.54	0.62	0.00	95	58.42	0	0.00	0	0.00	0	0.00
050901010202	West Branch Raccoon Creek	1.19	1.36	0.00	106	63.39	0	0.00	0	0.00	0	0.00
050901010203	Brushy Fork	0.56	1.12	0.00	153	61.26	0	0.00	0	0.00	0	0.00
050901010204	Twomile Run-Raccoon Creek	1.18	6.37	0.00	131	70.98	0	0.00	0	0.00	0	0.00
050901010205	Town of Zaleski-Raccoon Creek	2.45	4.94	0.00	207	70.44	4	64.50	4	55.75	4	62.89
050901010301	Hewett Fork	0.47	2.55	0.00	152	72.98	4	51.25	3	48.33	2	57.77
050901010302	Headwaters Elk Fork	1.48	2.14	0.00	293	64.47	0	0.00	0	0.00	0	0.00
050901010303	Flat Run-Elk Fork	0.43	4.65	0.00	57	85.36	0	0.00	0	0.00	0	0.00
050901010304	Flat Run-Raccoon Creek	0.85	2.97	0.00	303	66.98	0	0.00	0	0.00	0	0.00
050901010401	Headwaters Little Raccoon Creek	2.07	1.86	10.08	301	50.44	0	0.00	0	0.00	0	0.00
050901010402	Dickason Run	4.34	2.27	47.69	134	63.42	0	0.00	0	0.00	0	0.00
050901010403	Meadow Run-Little Raccoon Creek	1.74	5.52	0.00	387	74.91	1	66.50	1	26.00	1	31.13
050901010404	Deer Creek-Little Raccoon Creek	1.12	2.49	0.00	153	72.75	0	0.00	0	0.00	0	0.00
050901010501	Pierce Run	0.82	2.85	0.00	44	73.45	0	0.00	0	0.00	0	0.00
050901010502	Strongs Run	0.33	2.02	0.00	83	55.18	0	0.00	0	0.00	0	0.00
050901010503	Flatlick Run-Raccoon Creek	0.87	4.78	0.00	342	72.44	0	0.00	0	0.00	0	0.00
050901010504	Robinson Run-Raccoon Creek	1.71	1.53	10.82	121	50.03	0	0.00	0	0.00	0	0.00
050901010601	Indian Creek	0.67	0.62	7.81	52	66.97	0	0.00	0	0.00	0	0.00
050901010602	Barren Creek-Raccoon Creek	1.72	1.33	22.55	100	56.29	0	0.00	0	0.00	0	0.00
050901010603	Mud Creek-Raccoon Creek	0.33	0.34	0.00	76	36.45	0	0.00	0	0.00	0	0.00
050901010604	Bullskin Creek	0.08	0.05	38.66	11	62.59	0	0.00	0	0.00	0	0.00
050901010605	Claylick Run-Raccoon Creek	0.35	0.11	67.30	45	38.21	0	0.00	0	0.00	0	0.00
050901010703	Swan Creek	0.19	0.29	0.00	12	56.45	0	0.00	0	0.00	0	0.00
050901010704	Flatfoot Creek-Ohio River	1.09	0.05	95.65	5	45.77	0	0.00	0	0.00	0	0.00
050901010706	Little Indian Guyan Creek	0.11	0.45	0.00	37	59.56	0	0.00	0	0.00	0	0.00
050901010707	Johns Creek-Indian Guyan Creek	0.07	0.15	0.00	25	70.48	0	0.00	0	0.00	0	0.00
050901010708	Wolf Creek-Indian Guyan Creek	0.36	0.20	43.92	41	39.82	0	0.00	0	0.00	0	0.00
050901010709	Paddy Creek-Ohio River	0.77	0.13	82.86	29	30.67	0	0.00	0	0.00	0	0.00

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050901010801	Dirtyface Creek	2.08	1.47	29.50	30	70.51	0	0.00	0	0.00	0	0.00
050901010802	Black Fork	5.94	3.93	33.83	181	67.91	2	71.50	2	66.00	2	51.03
050901010803	Headwaters Symmes Creek	7.24	4.10	43.45	270	61.93	1	80.50	1	77.00	1	73.15
050901010901	Sand Fork	0.44	0.52	0.00	118	54.07	0	0.00	0	0.00	0	0.00
050901010902	Buffalo Creek	0.00	0.22	0.00	33	65.53	0	0.00	0	0.00	0	0.00
050901010903	Camp Creek-Symmes Creek	1.48	1.46	1.47	194	61.06	2	72.00	2	57.00	2	77.55
050901011001	Johns Creek	0.01	0.10	0.00	24	53.05	0	0.00	0	0.00	0	0.00
050901011002	Long Creek	0.00	0.11	0.00	22	46.40	0	0.00	0	0.00	0	0.00
050901011003	Pigeon Creek-Symmes Creek	0.39	0.34	12.99	52	44.64	0	0.00	0	0.00	0	0.00
050901011004	Aaron Creek-Symmes Creek	0.11	0.22	0.00	102	50.58	0	0.00	0	0.00	0	0.00
050901011005	McKinney Creek-Symmes Creek	0.19	0.17	10.68	27	35.26	0	0.00	0	0.00	0	0.00
050901011007	Buffalo Creek-Ohio River	0.87	0.35	59.87	13	19.16	0	0.00	0	0.00	0	0.00
050901030101	Solida Creek-Ohio River	0.51	0.53	0.00	18	17.30	0	0.00	0	0.00	0	0.00
050901030103	Ice Creek	0.12	0.14	0.00	28	22.54	0	0.00	0	0.00	0	0.00
050901030104	Storms Creek	0.21	0.22	0.00	25	41.53	0	0.00	0	0.00	0	0.00
050901030105	Pond Run-Ohio River	2.95	0.45	84.91	39	26.99	0	0.00	0	0.00	0	0.00
050901030106	Ginat Creek	6.45	0.37	94.34	46	28.81	0	0.00	0	0.00	0	0.00
050901030107	Grays Branch-Ohio River	2.56	0.23	91.14	24	25.11	0	0.00	0	0.00	0	0.00
050901030201	Hales Creek	1.42	1.27	10.57	101	47.83	0	0.00	0	0.00	0	0.00
050901030202	Headwaters Pine Creek	0.47	0.56	0.00	75	69.42	0	0.00	0	0.00	0	0.00
050901030203	Little Pine Creek	0.58	0.57	1.67	76	63.05	0	0.00	0	0.00	0	0.00
050901030204	Howard Run-Pine Creek	0.48	0.71	0.00	129	60.21	0	0.00	0	0.00	0	0.00
050901030205	Lick Run-Pine Creek	0.17	0.43	0.00	177	49.74	0	0.00	0	0.00	0	0.00
050901030501	Headwaters Little Scioto River	2.67	0.86	67.89	44	54.11	0	0.00	0	0.00	0	0.00
050901030502	Sugarcamp Creek	0.17	0.03	79.20	19	62.25	0	0.00	0	0.00	0	0.00
050901030503	Holland Fork	0.09	0.04	56.57	28	45.54	0	0.00	0	0.00	0	0.00
050901030504	McDowell Creek-Little Scioto River	0.38	0.09	76.69	48	58.68	0	0.00	0	0.00	0	0.00
050901030601	Headwaters Rocky Fork	0.13	0.13	0.30	19	63.77	0	0.00	0	0.00	0	0.00
050901030602	Long Run	0.11	0.01	90.85	11	42.23	0	0.00	0	0.00	0	0.00
050901030603	McConnel Creek-Rocky Fork	0.78	0.09	88.65	31	32.83	0	0.00	0	0.00	0	0.00
050901030604	Frederick Creek	0.06	0.02	73.72	10	39.43	0	0.00	0	0.00	0	0.00
050901030605	Wards Run-Little Scioto River	0.28	0.28	1.92	67	30.19	0	0.00	0	0.00	0	0.00
050901030606	Munn Run-Ohio River	0.21	1.31	0.00	28	23.60	0	0.00	0	0.00	0	0.00
050902010201	Headwaters Turkey Creek	0.00	0.07	0.00	5	57.26	0	0.00	0	0.00	0	0.00
050902010202	Odell Creek-Turkey Creek	0.34	0.54	0.00	28	44.98	0	0.00	0	0.00	0	0.00
050902010203	Pond Run	0.03	0.38	0.00	1	37.00	0	0.00	0	0.00	0	0.00
050902010204	Briery Branch-Ohio River	0.93	4.21	0.00	22	28.46	0	0.00	0	0.00	0	0.00
050902010205	Upper Twin Creek	0.20	1.32	0.00	24	57.60	0	0.00	0	0.00	0	0.00
050902010206	Lower Twin Creek	0.00	1.87	0.00	10	71.64	0	0.00	0	0.00	0	0.00

HUC12	HUC12 Name	Historic Wetland %	Curent Wetland %	Wetland Loss %	Number of NWI Wetlands	Area-Weighted Level 1 Score	Number of ORAM Assessments	Mean ORAM Score	Number of VIBI Assessments	Mean VIBI Score	Number of VIBI-FQ Assessments	Mean VIBI-FQ Score
050902010207	Rock Run-Ohio River	2.16	1.90	12.05	68	39.77	0	0.00	0	0.00	0	0.00
050902010209	Stout Run	0.70	0.83	0.00	22	45.46	0	0.00	0	0.00	0	0.00
050902010210	Quicks Run-Ohio River	1.71	1.19	30.06	63	48.14	0	0.00	0	0.00	0	0.00
050902010301	Headwaters Ohio Brush Creek	1.75	0.07	96.03	19	52.35	0	0.00	0	0.00	0	0.00
050902010302	Elk Run	1.04	0.03	96.92	6	66.16	0	0.00	0	0.00	0	0.00
050902010303	Baker Fork	1.53	0.04	97.11	20	43.03	0	0.00	0	0.00	0	0.00
050902010304	Middle Fork Ohio Brush Creek	6.14	0.42	93.08	54	60.70	0	0.00	0	0.00	0	0.00
050902010305	Flat Run-Ohio Brush Creek	1.00	0.44	56.38	45	61.19	0	0.00	0	0.00	0	0.00
050902010401	Little West Fork Ohio Brush Creek	2.48	0.12	95.28	33	45.01	0	0.00	0	0.00	0	0.00
050902010402	Headwaters West Fork Ohio Brush Creek	7.93	0.25	96.80	103	54.39	0	0.00	0	0.00	0	0.00
050902010403	Cherry Fork	0.40	0.16	59.75	152	37.12	0	0.00	0	0.00	0	0.00
050902010404	Georges Creek-West Fork Ohio Brush Creek	0.48	0.13	73.26	101	40.50	0	0.00	0	0.00	0	0.00
050902010501	Little East Fork-Ohio Brush Creek	2.83	0.21	92.42	189	40.00	0	0.00	0	0.00	0	0.00
050902010502	Lick Fork	0.38	0.04	89.80	49	39.22	0	0.00	0	0.00	0	0.00
050902010503	Bundle Run-Ohio Brush Creek	3.78	0.52	86.25	80	57.53	0	0.00	0	0.00	0	0.00
050902010504	Cedar Run-Ohio Brush Creek	1.98	0.23	88.38	84	47.22	0	0.00	0	0.00	0	0.00
050902010505	Beasley Fork	0.85	0.33	60.42	35	53.39	0	0.00	0	0.00	0	0.00
050902010506	Soldiers Run-Ohio Brush Creek	1.08	2.19	0.00	96	52.12	0	0.00	0	0.00	0	0.00
050902010601	Crooked Creek-Ohio River	1.49	1.34	10.04	55	52.34	0	0.00	0	0.00	0	0.00
050902010604	Big Threemile Creek	0.26	0.57	0.00	45	57.70	0	0.00	0	0.00	0	0.00
050902010605	Lawrence Creek-Ohio River	0.51	1.08	0.00	52	51.98	0	0.00	0	0.00	0	0.00
050902010701	Headwaters West Fork Eagle Creek	6.09	0.26	95.68	51	66.16	0	0.00	0	0.00	0	0.00
050902010702	Headwaters East Fork Eagle Creek	0.58	0.05	90.82	38	34.68	0	0.00	0	0.00	0	0.00
050902010703	Hills Fork-East Fork Eagle Creek	0.48	0.22	54.37	30	68.45	0	0.00	0	0.00	0	0.00
050902010704	Rattlesnake Creek-West Fork Eagle Creek	1.14	0.39	65.62	18	61.95	0	0.00	0	0.00	0	0.00
050902010705	Eagle Creek	0.17	0.95	0.00	81	68.83	0	0.00	0	0.00	0	0.00
050902010801	Redoak Creek	5.42	0.51	90.63	17	73.96	0	0.00	0	0.00	0	0.00
050902010802	Headwaters Straight Creek	21.67	0.19	99.12	56	67.45	0	0.00	0	0.00	0	0.00
050902010803	Evans Run-Straight Creek	1.90	0.35	81.46	28	53.42	0	0.00	0	0.00	0	0.00
050902010804	Lee Creek-Ohio River	0.45	1.23	0.00	12	60.14	0	0.00	0	0.00	0	0.00
050902010901	Headwaters East Fork Whiteoak Creek	15.93	0.13	99.20	36	49.67	0	0.00	0	0.00	0	0.00
050902010902	Slabcamp Run-East Fork Whiteoak Creek	30.82	0.14	99.53	47	55.01	0	0.00	0	0.00	0	0.00
050902010903	Little North Fork-North Fork Whiteoak Creek	32.84	0.36	98.90	41	56.60	0	0.00	0	0.00	0	0.00
050902010904	Flat Run-North Fork Whiteoak Creek	48.28	0.49	98.99	62	60.55	0	0.00	0	0.00	0	0.00
050902011001	Sterling Run	55.30	0.41	99.25	41	51.29	0	0.00	0	0.00	0	0.00
050902011002	Miranda Run-Whiteoak Creek	22.29	0.26	98.84	50	56.64	0	0.00	0	0.00	0	0.00
050902011003	Big Run-Whiteoak Creek	4.57	0.55	87.93	20	61.40	0	0.00	0	0.00	0	0.00
050902011102	Turtle Creek-Ohio River	0.34	0.01	95.82	4	37.00	0	0.00	0	0.00	0	0.00
050902011103	West Branch Bullskin Creek	9.66	0.80	91.77	88	51.25	0	0.00	0	0.00	0	0.00

HUC12	HUC12 Name	Historic Wetland %	Curent Wetland %	Wetland Loss %	Number of NWI Wetlands	Area-Weighted Level 1 Score	Number of ORAM Assessments	Mean ORAM Score	Number of VIBI Assessments	Mean VIBI Score	Number of VIBI-FQ Assessments	Mean VIBI-FQ Score
050902011104	Bullskin Creek	5.71	0.53	90.65	78	63.52	0	0.00	0	0.00	0	0.00
050902011106	Bear Creek-Ohio River	1.26	0.84	33.26	63	57.72	0	0.00	0	0.00	0	0.00
050902011107	Little Indian Creek-Ohio River	0.66	0.98	0.00	15	58.17	0	0.00	0	0.00	0	0.00
050902011201	Headwaters Big Indian Creek	9.75	0.77	92.12	76	52.40	0	0.00	0	0.00	0	0.00
050902011202	North Fork Indian Creek-Big Indian Creek	7.32	0.81	88.99	59	60.61	0	0.00	0	0.00	0	0.00
050902011203	Boat Run-Ohio River	0.73	0.25	65.07	15	31.61	0	0.00	0	0.00	0	0.00
050902011204	Ferguson Run-Twelvemile Creek	9.51	0.92	90.32	42	47.04	0	0.00	0	0.00	0	0.00
050902011206	Tenmile Creek	2.56	0.18	93.08	26	36.64	0	0.00	0	0.00	0	0.00
050902011208	Ninemile Creek-Ohio River	1.68	0.16	90.28	16	39.73	0	0.00	0	0.00	0	0.00
050902020101	Headwaters Little Miami River	43.41	0.81	98.14	66	41.79	0	0.00	0	0.00	0	0.00
050902020102	North Fork Little Miami River	33.43	1.50	95.51	138	42.52	1	40.00	1	23.00	1	18.58
050902020103	Buffenbarger Cemetery-Little Miami River	36.11	0.42	98.83	67	36.06	0	0.00	0	0.00	0	0.00
050902020104	Yellow Springs Creek-Little Miami River	18.19	0.25	98.63	49	37.00	0	0.00	0	0.00	0	0.00
050902020201	North Fork Massies Creek	46.10	0.29	99.36	60	31.63	0	0.00	0	0.00	0	0.00
050902020202	South Fork Massies Creek	50.46	0.26	99.49	37	46.86	0	0.00	0	0.00	0	0.00
050902020203	Massies Creek	13.87	0.13	99.06	25	33.19	0	0.00	0	0.00	0	0.00
050902020204	Little Beaver Creek	12.57	0.22	98.22	28	16.03	0	0.00	0	0.00	0	0.00
050902020205	Beaver Creek	15.66	3.31	78.85	74	33.88	2	47.50	2	38.50	0	0.00
050902020206	Shawnee Creek-Little Miami River	16.55	0.29	98.22	38	30.37	0	0.00	0	0.00	0	0.00
050902020301	Headwaters Anderson Fork	41.01	0.16	99.60	36	40.40	0	0.00	0	0.00	0	0.00
050902020302	Painters Run-Anderson Fork	34.22	0.27	99.22	29	53.41	0	0.00	0	0.00	0	0.00
050902020303	Mouth Anderson Fork	14.90	0.11	99.26	8	45.40	0	0.00	0	0.00	0	0.00
050902020401	North Branch Caesar Creek	41.25	0.05	99.88	13	41.59	0	0.00	0	0.00	0	0.00
050902020402	Upper Caesar Creek	38.69	0.08	99.78	12	34.21	0	0.00	0	0.00	0	0.00
050902020403	South Branch Caesar Creek	38.80	0.17	99.56	12	55.36	0	0.00	0	0.00	0	0.00
050902020404	Middle Caesar Creek	13.24	0.28	97.86	29	44.93	0	0.00	0	0.00	0	0.00
050902020405	Flat Fork	46.32	1.47	96.82	60	59.74	0	0.00	0	0.00	0	0.00
050902020406	Lower Caesar Creek	10.86	0.19	98.27	28	58.11	0	0.00	0	0.00	0	0.00
050902020501	Sugar Creek	15.02	0.18	98.77	39	29.21	0	0.00	0	0.00	0	0.00
050902020502	Town of Bellbrook-Little Miami River	6.98	0.08	98.80	11	24.61	0	0.00	0	0.00	0	0.00
050902020503	Glady Run	12.26	0.62	94.96	17	29.25	0	0.00	0	0.00	0	0.00
050902020504	Newman Run-Little Miami River	9.47	0.50	94.68	111	52.63	0	0.00	0	0.00	0	0.00
050902020601	Dutch Creek	22.99	0.75	96.75	14	62.40	0	0.00	0	0.00	0	0.00
050902020602	Headwaters Todd Fork	27.38	0.23	99.14	30	46.92	0	0.00	0	0.00	0	0.00
050902020603	Lytle Creek	11.11	0.38	96.63	21	38.18	0	0.00	0	0.00	0	0.00
050902020604	Headwaters Cowan Creek	32.23	0.17	99.48	27	37.01	0	0.00	0	0.00	0	0.00
050902020605	Wilson Creek-Cowan Creek	8.87	0.46	94.83	27	57.75	0	0.00	0	0.00	0	0.00
050902020606	Little Creek-Todd Fork	20.45	1.01	95.07	28	77.20	0	0.00	0	0.00	0	0.00
050902020701	East Fork Todd Fork	30.44	0.48	98.43	41	62.29	1	74.00	1	70.00	1	62.75

HUC12	HUC12 Name	Historic Wetland %	Curent Wetland %	Wetland Loss %	Number of NWI Wetlands	Area-Weighted Level 1 Score	Number of ORAM Assessments	Mean ORAM Score	Number of VIBI Assessments	Mean VIBI Score	Number of VIBI-FQ Assessments	Mean VIBI-FQ Score
050902020702	Second Creek	34.50	0.42	98.78	34	51.51	0	0.00	0	0.00	0	0.00
050902020703	First Creek	42.06	0.60	98.57	46	44.79	0	0.00	0	0.00	0	0.00
050902020704	Lick Run-Todd Fork	22.73	0.47	97.94	96	56.84	0	0.00	0	0.00	0	0.00
050902020801	Ferris Run-Little Miami River	9.32	0.42	95.53	68	53.37	0	0.00	0	0.00	0	0.00
050902020802	Little Muddy Creek	22.37	0.72	96.78	56	22.69	0	0.00	0	0.00	0	0.00
050902020803	Turtle Creek	7.32	0.26	96.48	90	29.54	0	0.00	0	0.00	0	0.00
050902020804	Halls Creek-Little Miami River	4.92	0.48	90.14	72	32.09	0	0.00	0	0.00	0	0.00
050902020901	Muddy Creek	15.05	0.21	98.61	26	10.80	0	0.00	0	0.00	0	0.00
050902020902	O'Bannon Creek	31.89	1.99	93.76	200	59.00	0	0.00	0	0.00	0	0.00
050902020903	Salt Run-Little Miami River	13.35	0.20	98.49	59	33.09	0	0.00	0	0.00	0	0.00
050902021001	Turtle Creek	21.19	0.50	97.65	27	60.05	0	0.00	0	0.00	0	0.00
050902021002	Headwaters East Fork Little Miami River	25.93	0.29	98.89	40	45.73	0	0.00	0	0.00	0	0.00
050902021003	Headwaters Dodson Creek	26.99	0.21	99.22	31	43.01	0	0.00	0	0.00	0	0.00
050902021004	Anthony Run-Dodson Creek	46.46	0.22	99.53	18	49.21	0	0.00	0	0.00	0	0.00
050902021005	West Fork East Fork Little Miami River	41.79	0.56	98.66	31	46.30	0	0.00	0	0.00	0	0.00
050902021006	Glady Creek-East Fork Little Miami River	39.23	0.44	98.87	49	53.86	0	0.00	0	0.00	0	0.00
050902021101	Solomon Run-East Fork Little Miami River	39.66	0.56	98.59	95	50.55	0	0.00	0	0.00	0	0.00
050902021102	Fivemile Creek-East Fork Little Miami River	48.14	1.27	97.36	156	57.47	0	0.00	0	0.00	0	0.00
050902021103	Todd Run-East Fork Little Miami River	37.57	1.22	96.76	81	57.08	0	0.00	0	0.00	0	0.00
050902021201	Poplar Creek	29.61	2.21	92.53	138	62.05	0	0.00	0	0.00	0	0.00
050902021202	Cloverlick Creek	39.25	1.15	97.07	134	60.78	0	0.00	0	0.00	0	0.00
050902021203	Lucy Run-East Fork Little Miami River	8.51	0.65	92.41	106	49.17	0	0.00	0	0.00	0	0.00
050902021204	Backbone Creek-East Fork Little Miami River	14.36	0.88	93.84	57	48.27	0	0.00	0	0.00	0	0.00
050902021301	Headwaters Stonelick Creek	42.38	1.86	95.61	109	52.47	0	0.00	0	0.00	0	0.00
050902021302	Brushy Fork	39.39	0.54	98.63	40	52.40	0	0.00	0	0.00	0	0.00
050902021303	Moores Fork-Stonelick Creek	41.27	1.33	96.78	80	46.82	0	0.00	0	0.00	0	0.00
050902021304	Lick Fork-Stonelick Creek	16.65	1.59	90.44	84	53.69	0	0.00	0	0.00	0	0.00
050902021305	Salt Run-East Fork Little Miami River	3.75	0.23	93.95	85	25.07	0	0.00	0	0.00	0	0.00
050902021401	Sycamore Creek	3.48	0.02	99.37	5	59.01	0	0.00	0	0.00	0	0.00
050902021402	Polk Run-Little Miami River	5.06	0.21	95.85	14	16.91	0	0.00	0	0.00	0	0.00
050902021403	Horner Run-Little Miami River	3.34	0.44	86.98	29	35.47	0	0.00	0	0.00	0	0.00
050902021404	Duck Creek	3.05	0.00	99.86	1	14.00	0	0.00	0	0.00	0	0.00
050902021405	Dry Run-Little Miami River	2.80	1.02	63.53	23	34.24	0	0.00	0	0.00	0	0.00
050902021406	Clough Creek-Little Miami River	2.77	0.60	78.42	16	35.09	0	0.00	0	0.00	0	0.00
050902030101	East Fork Mill Creek-Mill Creek	8.19	0.72	91.18	53	24.43	0	0.00	0	0.00	0	0.00
050902030102	West Fork Mill Creek	3.29	0.07	97.79	12	36.69	0	0.00	0	0.00	0	0.00
050902030103	Sharon Creek-Mill Creek	5.06	0.09	98.24	5	31.89	0	0.00	0	0.00	0	0.00
050902030104	Congress Run-Mill Creek	2.52	0.02	99.39	2	24.42	0	0.00	0	0.00	0	0.00
050902030105	West Fork-Mill Creek	1.23	0.00	100.00	0	0.00	0	0.00	0	0.00	0	0.00

HUC12	HUC12 Name	Historic Wetland %	Curent Wetland %	Wetland Loss %	Number of NWI Wetlands	Area-Weighted Level 1 Score	Number of ORAM Assessments	Mean ORAM Score	Number of VIBI Assessments	Mean VIBI Score	Number of VIBI-FQ Assessments	Mean VIBI-FQ Score
050902030201	Town of Newport-Ohio River	1.99	0.18	91.15	2	49.20	0	0.00	0	0.00	0	0.00
050902030202	Dry Creek-Ohio River	1.52	0.01	99.03	1	18.00	0	0.00	0	0.00	0	0.00
050902030203	Muddy Creek	1.57	0.07	95.73	3	24.39	0	0.00	0	0.00	0	0.00
050902030204	Garrison Creek-Ohio River	1.10	0.26	76.10	6	35.40	0	0.00	0	0.00	0	0.00
051201010101	Headwaters Wabash River	42.05	0.34	99.19	83	47.45	0	0.00	0	0.00	0	0.00
051201010102	Stoney Creek-Wabash River	24.52	0.80	96.72	77	35.82	0	0.00	0	0.00	0	0.00
051201010103	Toti Creek-Wabash River	18.63	0.50	97.29	54	32.41	0	0.00	0	0.00	0	0.00
051201010201	Chickasaw Creek	35.76	0.12	99.65	42	39.35	0	0.00	0	0.00	0	0.00
051201010202	Headwaters Beaver Creek	34.72	0.20	99.42	51	33.85	0	0.00	0	0.00	0	0.00
051201010203	Coldwater Creek	30.84	0.12	99.62	29	41.53	0	0.00	0	0.00	0	0.00
051201010204	Grand Lake-St Marys	26.39	1.53	94.18	232	36.39	1	25.00	1	16.00	1	12.19
051201010301	Little Beaver Creek	29.44	0.08	99.73	14	32.38	0	0.00	0	0.00	0	0.00
051201010302	Hardin Creek-Beaver Creek	43.24	0.17	99.61	26	25.81	0	0.00	0	0.00	0	0.00
051201010303	Prairie Creek-Beaver Creek	40.47	0.18	99.56	53	59.35	0	0.00	0	0.00	0	0.00
051201010401	Wilson Creek-Limberlost Creek	26.11	0.16	99.41	1	32.00	0	0.00	0	0.00	0	0.00
051201010501	Hickory Branch-Wabash River	34.12	0.91	97.33	18	50.04	0	0.00	0	0.00	0	0.00
051201030101	Little Mississinewa River	25.67	0.00	100.00	0	0.00	0	0.00	0	0.00	0	0.00
051201030102	Gray Branch-Mississinewa River	33.70	0.42	98.76	57	39.48	0	0.00	0	0.00	0	0.00
051201030103	Jordan Creek-Mississinewa River	27.30	0.25	99.10	7	39.03	0	0.00	0	0.00	0	0.00

Addressing Waters Not Meeting Water Quality Goals

The federal Clean Water Act (CWA) requires that states identify waters not meeting water quality goals and then prioritize them for action to restore their beneficial uses[1]. The resulting list of prioritized impaired waters is known as the 303(d) list. Ohio's 2016 303(d) list is presented in Section L4 of this report.

Ohio made substantial changes to its listing process in 2010 (see Sections A and J in the 2010 Integrated Report [Ohio EPA, 2010]); Ohio's 2012 Integrated Report and 303(d) list (Ohio EPA, 2012) contained relatively few changes compared to the major adjustments made in 2010. A significant change to the 2014 report included the addition of a new indicator (algae) to the public drinking water supply (PDWS) use. This 2016 report contains changes in how the information is organized and what data sets were used (for instance, 2015 data was included for both recreation and PDWS uses), but no significant changes in the assessment methods were made. This section outlines the listing framework; lays out the prioritizing and delisting processes and results; and reports on the status of Ohio total maximum daily load (TMDL) efforts including schedules for future TMDLs and monitoring in Ohio.

J1. Ohio's 303(d) Listing Framework

The process of listing involves assigning a condition status (a category) for each of four beneficial uses for each assessment unit (AU). Data requirements, descriptions of available data, assessment methodologies and results were discussed and reported by individual beneficial use in Sections E, F, G and H.

In 2010, Ohio modified the five-category listing structure suggested by U.S. EPA to accommodate listing by beneficial use and introduced subcategories to give more information about the status of each water. In 2012, one additional subcategory, "t," was added to aid reporting the status of AUs relative to approved TMDLs[2] and data availability. In 2014, the "t" subcategory was altered slightly and a new category "d" was added to better reflect circumstances encountered as Ohio EPA revisits watersheds having approved TMDLs. In 2016, a new subcategory in Category 5 (i.e., 5-alternative or 5-alt) was added to report on alternative restoration approaches for CWA 303(d) listed waters. Such waters will still require TMDLs until water quality standards are achieved. Ohio does not have any AUs listed under 5-alt in this report, but anticipates using this subcategory in the future.

Table J-1 summarizes the categories and subcategories used in this report.

Also in 2010, Ohio began listing by beneficial use within each AU and reporting on a smaller AU size. Watershed AUs shifted from an average size of 130 square miles to 27 square miles. Under the old system, an impairment of one beneficial use caused the AU to be category 5 (impaired) regardless of the status of other uses.

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[1] Beneficial uses include aquatic life, human health (fish contaminants), recreation (bacteria) and public [drinking] water supply.

[2] As discussed in Section C-1, the Ohio Supreme Court ruled in *Fairfield Cty. Bd. of Commrs. v. Nally,* 143 Ohio St. 3d 93, 2015-Ohio-991, that Ohio EPA must follow the rulemaking procedures in Ohio Revised Code Chapter 119 before submitting a TMDL to U.S. EPA for approval. Because none of Ohio EPA's TMDLs have been adopted as rules under R.C. Chapter 119, the effect of the Ohio Supreme Court ruling is arguably invalidation of all previously approved TMDLs. Although Ohio EPA is currently evaluating alternatives for addressing both past and future TMDLs, this situation should be kept in mind while reading this section.

Table J-1. Category definitions for the 2016 Integrated Report and 303(d) list.

Category[3]		Subcategory	
0	No water currently utilized for water supply		
1	Use attaining	d	TMDL complete; new data show the AU is attaining WQS
		h	Historical data
		t	TMDL complete at HUC[4] 11 scale; AU attaining WQS at HUC 12 scale
		x	Retained from 2008 IR
2	Not applicable in Ohio system		
3	Use attainment unknown	h	Historical data
		i	Insufficient data
		t	TMDL complete at HUC 11 scale; there may be no or not enough data to assess this AU at the HUC 12 scale
		x	Retained from 2008 IR
4	Impaired; TMDL not needed	A	TMDL complete[5]
		B	Other required control measures will result in attainment of use
		C	Not a pollutant
		h	Historical data
		n	Natural causes and sources
		x	Retained from 2008 IR
5	Impaired; TMDL needed	alt	Alternative restoration approaches[6]
		M	Mercury
		d	TMDL complete; new data show the AU is not attaining WQS
		h	Historical data
		x	Retained from 2008 IR

Figure J-1 illustrates the significance of these changes in the listing procedures. "A" refers to aquatic life use; "R," recreation use; "H," human health use; and "P," public water supply use. The numbers refer to the categories described in Table J-1 above. In the example, an AU listed in 2008 as impaired (*i.e.*, category 5) appeared on the 2010 303(d) list as five units with four uses each; thus, reporting one piece of information changed to reporting 20 pieces of information. Whereas the 2008 list indicated only that the unit was impaired, the new listing indicates all of the following information:

- Aquatic life use is impaired (5) in one unit, not impaired (1) in one and unknown (3) in one. A TMDL to address impairments has been completed in one unit (4A) and the impairment in the remaining unit is being addressed in some other way (4B, e.g., a discharge permit).
- Recreation use is impaired (5) in three units, unknown (3) in one and a TMDL to address the impairment in one unit has been completed (4A).

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[3] Shading indicates categories defined by U.S. EPA; other categories and subcategories are defined by Ohio EPA.
[4] HUC means "hydrologic unit code."
[5] While Ohio has completed these TMDLs and they were approved by U.S. EPA, in March 2015 in *Fairfield Cty. Bd. of Commrs. v. Nally,* 143 Ohio St. 3d 93, 2015-Ohio-991, the Ohio Supreme Court determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act." See Section C (page C-17) for more details.
[6] Ohio currently has no waters that are listed under this subcategory.

- Human health results based on fish tissue analysis indicate that four of the five units are impaired (5) and one is unknown (3).
- Public drinking water supplies exist in only two of the five units and one of those is impaired (5). The status of the other is unknown (3).

For the aquatic life use, Ohio EPA continues the transition that began in 2010 of translating data evaluated at the 11-digit hydrologic unit size to the smaller 12-digit size. We expect that the few remaining relic categories will be dealt with as those areas are monitored again.

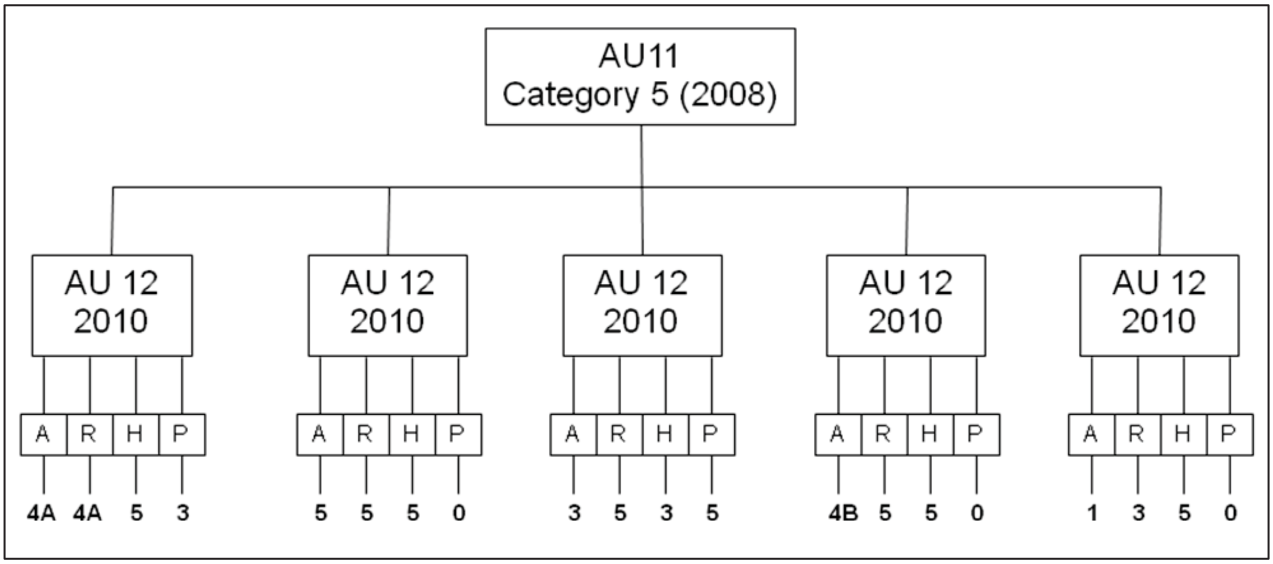

Figure J- 1. Listing by smaller AUs and individual beneficial uses.

Table J-2 shows the number of potential listings that could result from the combination of smaller AUs and listing by individual use.

Table J-2. Potential listing opportunities in Ohio's listing framework.

	2008 and Before			2010 and After		
AU Types	Number of AUs	Status Reports per Unit	Total Number of Possible Listings	Number of AUs	Status Reports per Unit	Total Number of Possible Listings
Watershed	331	1	331	1538	4	6,152
Large river	23	1	23	38	4	152
Lake Erie shore	3	1	3	3	4	12
Totals	**357**	**1**	**357**	**1,579**	**4**	**6,316**

J2. Prioritizing the Impaired Waters: the 303(d) List

As previously stated, the impaired waters are identified and assigned a category by individual beneficial use in Sections E, F, G and H. After waters are identified as impaired and it is determined that a TMDL is required, the waters are prioritized to produce the 303(d) list (see Section L4). Because Ohio uses a highly integrated monitoring and TMDL linkage to ensure efficient use of resources, it makes sense to continue to set priorities by AU rather than by individual use.

Ohio River and Open Waters of Lake Erie

Other organizations have lead responsibility for two special waters affected by multiple jurisdictions: U.S. EPA for the open waters of Lake Erie and ORSANCO for the mainstem of the Ohio River. Ohio EPA is actively participating in TMDL and similar actions conducted by these organizations, so priority for *Ohio EPA-initiated action* is assigned a low priority for these waters. TMDLs in watersheds that drain to the Ohio River and Lake Erie will reduce the pollutant load delivered to each water.

Inland Waters and Lake Erie Shoreline

A point system is used to assign priority to impaired AUs. A total of 22 points could be assigned to an AU, distributed as shown in Figure J-3. The priority results for specific AUs are reported in Section L and in AU summary information available on the web page.

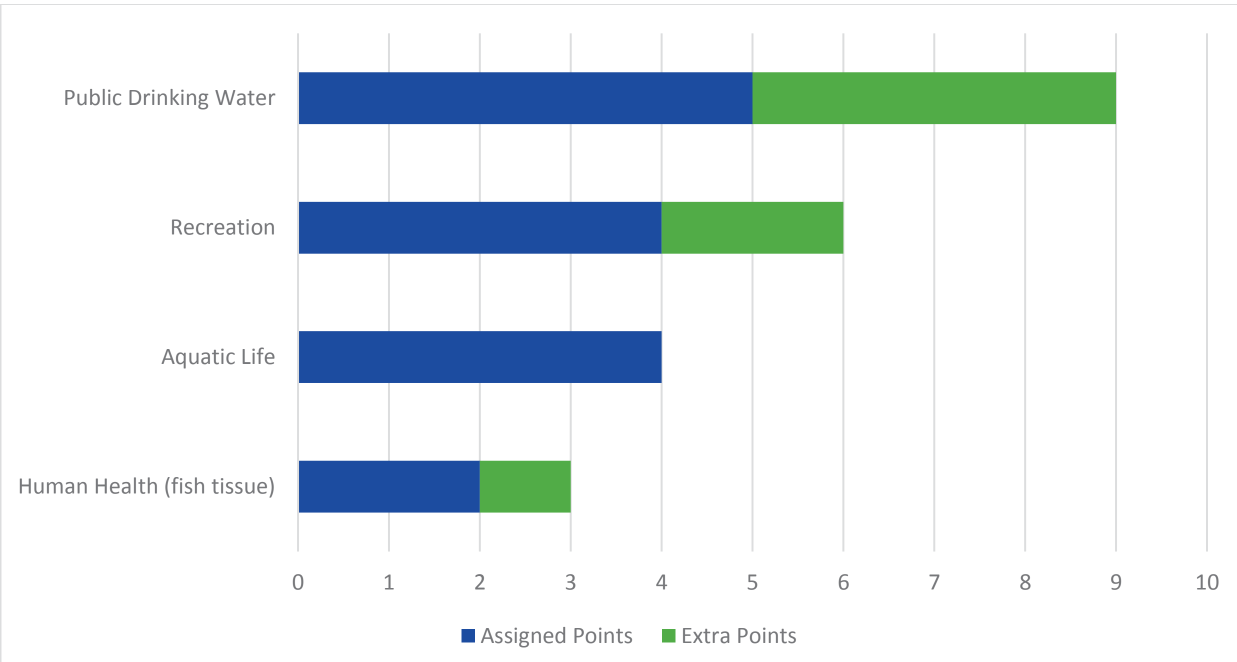

Figure J-2. Priority points assigned based on use impairment or other factors (extra points).

The AUs are assigned priority points using the guidelines in Table J-3. The points assigned to the public drinking water and human health uses are straightforward. For the recreation and aquatic life uses, points are assigned based on a computed index score (see Sections F2 and G2). The lowest quartile (scores between 0 and 25) get the fewest points because a TMDL may not be the most effective way to address the impairments. Scores in this range indicate severe basin-wide problems, comprehensive degradation that may require significant time and resources and broad-scale fixes, including, possibly, fundamental changes in land use practices. Education about the effects various practices have on water quality and encouraging stewardship may be more effective in these areas than a traditional TMDL approach. Scores in the highest quartile (between 75.1 and 100) generally indicate a localized water quality issue. Addressing the impairment may not require a complete watershed effort; rather, a targeted fix for a particular problem may be most effective. Thus, these receive the next lowest number of priority points. The most points are awarded for scores in the middle quartiles (between 25.1 and 50 and between 50.1 and 75), indicating problems of such scale that purposeful action should produce a

measurable response within a 10-year period. These waters are the best candidates for a traditional TMDL.

Two additional points may be awarded to AUs that are impaired for the recreation use and contain Class A waters. Class A waters are those most suitable for recreation, such as popular paddling streams and lakes with public access points developed, maintained and publicized by governmental entities.

Table J-3. Priority points for impaired AUs.

Points	Condition	Number of AUs WAUs	LRAUs
Human Health Use impairment (fish tissue contaminants) (maximum of 3 points)			
2	Listed as impaired for Fish Contaminants (Human Health Use)	427	35
+1	Additional point in AUs that have greater than 500 ppb PCBs or mercury	1	1
Recreation Use impairment (maximum of 6 points)			
1	Listed as impaired, with AU score[7] between 0 and 25	77	0
2	Listed as impaired, with AU score between 75.1 and 100	92	14
3	Listed as impaired, with AU score between 25.1 and 50	248	2
4	Listed as impaired, with AU score between 50.1 and 75	272	7
+2	Additional points if AU contains Class A waters	36	23
Aquatic Life Use impairment (maximum of 4 points)			
1	Listed as impaired, with AU score between 0 and 25	172	0
2	Listed as impaired, with AU score between 75.1 and 100	29	8
3	Listed as impaired, with AU score between 25.1 and 50	121	2
4	Listed as impaired, with AU score between 50.1 and 75	112	2
Public Drinking Water Use impairment (maximum of 9 points)			
5	Listed as impaired for Public Drinking Water Use for one indicator	20	3
+2	Additional points in AUs impaired for each additional indicator	0	1
1	Not listed as impaired, but on watch list; one point for each indicator	40	4

As outlined in Section C8, the priority schedule for TMDL projects in Table J-15 was developed considering the above information, as well as the following:

- Social Factors (highly used recreational waters, drinking water supply for significant populations, ongoing/sustained involvement of any local groups or government, *etc.*)
- Value Added (is a TMDL the most efficient way to achieve improved water quality?)
- Is there an approved watershed action plan – if so how many implemented projects?
- How much regulatory authority exists over sources?
- Is there an alternative way to improve water quality more quickly than a TMDL? (*e.g.* immediate implementation of an existing plan or projects, or imposing more stringent permit limits to address a localized problem)
- Are there other factors in play? Examples include:
    - Pending enforcement for a discharger (possible 4B option)

[7] The AU score referenced throughout this table is reported on the summary sheets in Section L and on the AU summaries on the web.

- o U.S. Army Corps of Engineers modeling of reservoir discharge to improve downstream water quality
- o Local or statewide strategy or requirements in place to address a particular issue/pollutant (*e.g.* new health department rules for home sewage treatment systems if they are sole/primary source of impairment)

Near Term Priorities for Ohio EPA
Ohio is facing increasing problems with cyanobacteria blooms in inland lakes, including development of HABs in source waters. Many public water systems are experiencing increased treatment costs to manage the extra carbon load and cyanotoxins at their intake. The smaller conventional systems will have difficulty treating water for these problems and the expense will be very high to upgrade those plants.

In the 2014 Integrated Report, Ohio listed waters impaired by algal toxins for the first time. In the 2016 report, more waters are listed, especially lakes and reservoirs. To emphasize protection of the Public Drinking Water Supply beneficial use from HABs, Ohio is making inland lakes used for public water supply a focus for the next several years for monitoring and improving water quality through TMDLs or other approaches.

Based on a review of the inland lakes or reservoirs that were listed as impaired or on the Watch List for algae indicators in the 2014 Integrated Report, as well as the more recent data collected for algae at PDWS with intakes in inland lakes or reservoirs that led to the 303(d) listing in this report, the following inland lakes were chosen as Ohio's priorities for the next few years:

Tappan Lake in Harrison county (upper Little Stillwater Creek)
W.H. Harsha Lake in Clermont County (Lucy Run - East Fork Little Miami River)
Clyde/Beaver Creek Reservoir in Seneca County (Beaver Creek, Green Creek)

The impairments (or watch list parameters) cited include nitrate, pesticides and algae indicators. Where there is a TMDL developed it is older and/or does not include the stream reaches that most impact the lake/reservoir. In most cases, there are active local parties interested and/or there is a sizable population served by these sources. Ohio EPA considers nutrients (primarily phosphorus as the TMDL parameter) to be the priority for the inland lake efforts. However, the cause of impairment in more than one area also includes pesticides and/or nitrates, so other pollutants may be added to the TMDL or alternative plan. **These waters are listed on the 303(d) Priority list in Section L4 as follows:**

AU Number	AU Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points
05040001 15 03	Upper Little Stillwater Creek	29.72	1	1	3	5	5
05090202 12 03	Lucy Run-East Fork Little Miami River	32.48	1	1	5	5	7
04100011 12 02	Beaver Creek	29.3	3i	4Ah	4A	5	5
04100011 12 03	Green Creek	30.78	1	5	4A	5	9

While they do not have the highest priority points, the AUs with higher priority points that include a PDWS impairment already have a TMDL under development or will be addressed through other means such as the Great Lakes Water Quality Agreement Annex 4 nutrient reduction efforts discussed in J3.

Tappan Lake

- Stillwater Creek basin – primarily forest with mining influences.
- 2,350 acres of water surface.
- Provides drinking water to the Village of Cadiz (*pop.* ~ 3,350).
- Lake is operated by the U.S. Army Corp of Engineers. It is a multipurpose project for flood reduction, recreation and fish and wildlife enhancement.
- Assessed by Ohio EPA in 2012-2013 and did not meet the draft lake habitat use criteria.
- 2014 Integrated Report listed the lake as impaired for PDWS based on algae indicators (microcystin).

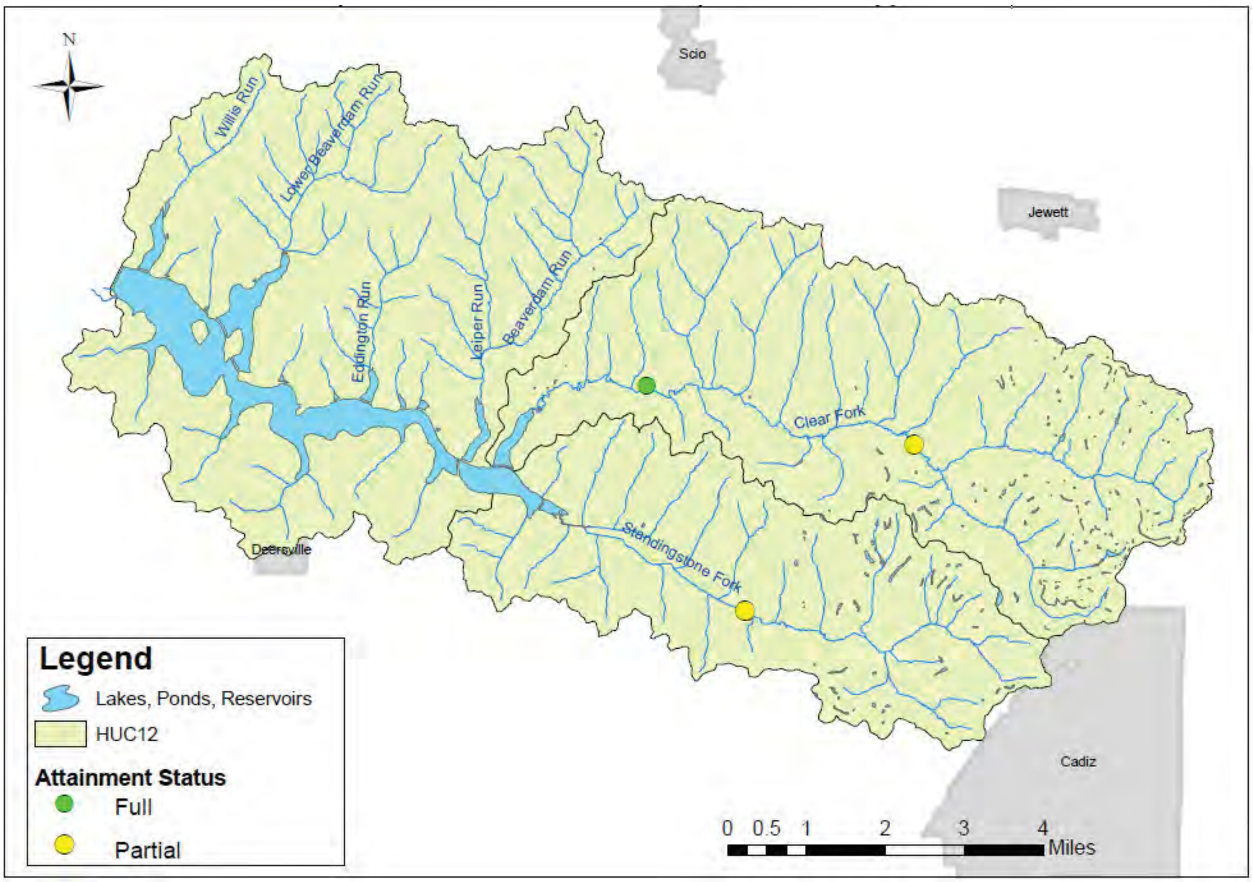

Figure J- 3. Watershed upstream from Tappan Lake and attainment status of sites from 2012 Stillwater River survey.

William H. Harsha Lake

- Located in the East Fork of the Little Miami River watershed – largely agriculture and forest with some urban influence.
- 2,160 acres of water surface.
- Lake is operated by the U.S. Army Corp of Engineers and is a multipurpose project for flood reduction, water supply, recreation and wildlife habitat.
- 2014 Integrated Report listed the lake as impaired for PDWS based on algae indicators (microcystin) and placed it on the watch list for atrazine.

From the Ohio EPA East Fork Little Miami River Technical Support Document, 2014:

- Clermont County operates a community public water system that serves a population of approximately 117,097 people. The water supply sells water to the village of Batavia, village of Williamsburg and New Richmond Robin-Grays water system. Clermont County operates two ground water plants and one surface water plant. The BMW surface water plant draws water from an intake structure on Harsha (East Fork) Lake. The system's treatment capacity is approximately 27.5 million gallons per day, but current average production is 12.5 million gallons per day.
- There are several environmental organizations active in the East Fork Little Miami River watershed. The oldest of these is Little Miami Incorporated (LMI) which has been active for 45 years. Most of LMI's activities have involved the purchase of conservation easements or property purchases in the riparian zone of the river. Clermont County and SWCDs in Clermont, Brown, Highland and Clinton counties formed the East Fork Watershed Collaborative to take advantage of ODNR's Watershed Coordinator Program.
- Several research projects have been initiated in the East Fork watershed and Harsha Lake by U.S. EPA's National Exposure Research Laboratory in Cincinnati and the U. S. Army Corps of Engineers. Among other topics research and monitoring are examining HABs and nutrients, impacts on the Clermont County water intake, carbon sequestration, methane release, nutrient trading, environmental tipping points and fish population genetics. At this time seven different projects are conducting monitoring in Harsha Lake.

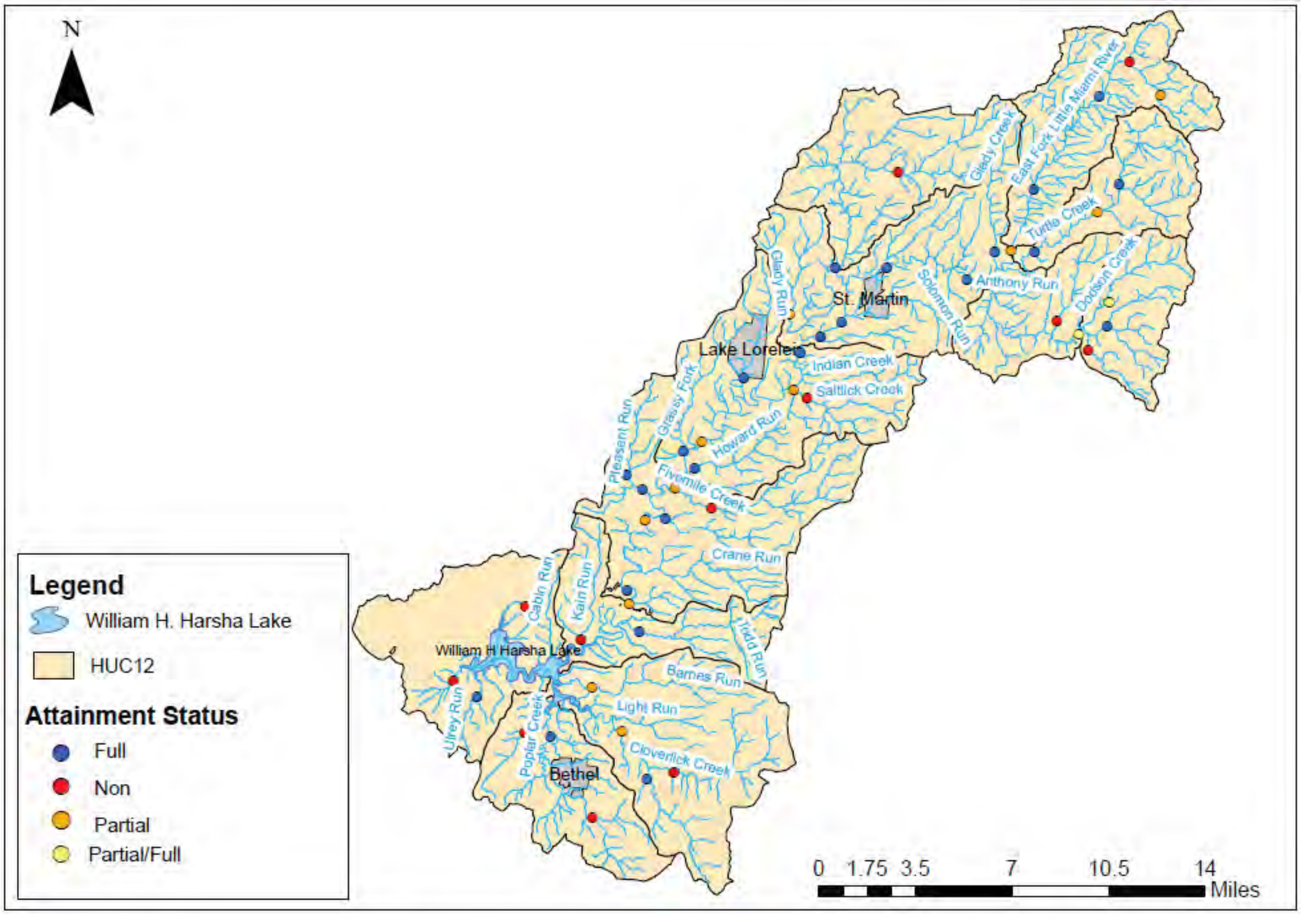

Figure J- 4. Watershed upstream from Harsha Lake and the attainment status of sites from the 2012 East Fork Little Miami River survey.

Clyde/Beaver Creek Reservoir (up-ground)

- Sandusky river watershed - primarily agricultural land use above reservoir.
- 110 acres of water surface.
- Provides drinking water to the City of Clyde (*pop.* ~6,320).
- Reservoir was assessed by Ohio EPA in 2009-2010 and did not meet the draft lake habitat use criteria.
- 2014 Integrated Report placed the lake on the watch list for PDWS based on algae indicators (microcystin) and nitrates. The 2016 Integrated Report will list it as impaired for PDWS based on algae indicators.
- The Raccoon Creek reservoir that also serves the City of Clyde is actually filled with water from Beaver Creek. The Raccoon creek reservoir was listed in the 2014 IR as impaired for PDWS based on algae indicators (microcystin).
- A TMDL for the lower Sandusky River was completed by Ohio EPA and approved by U.S. EPA, but did not set specific loads for Beaver Creek since the stream was not listed as impaired.

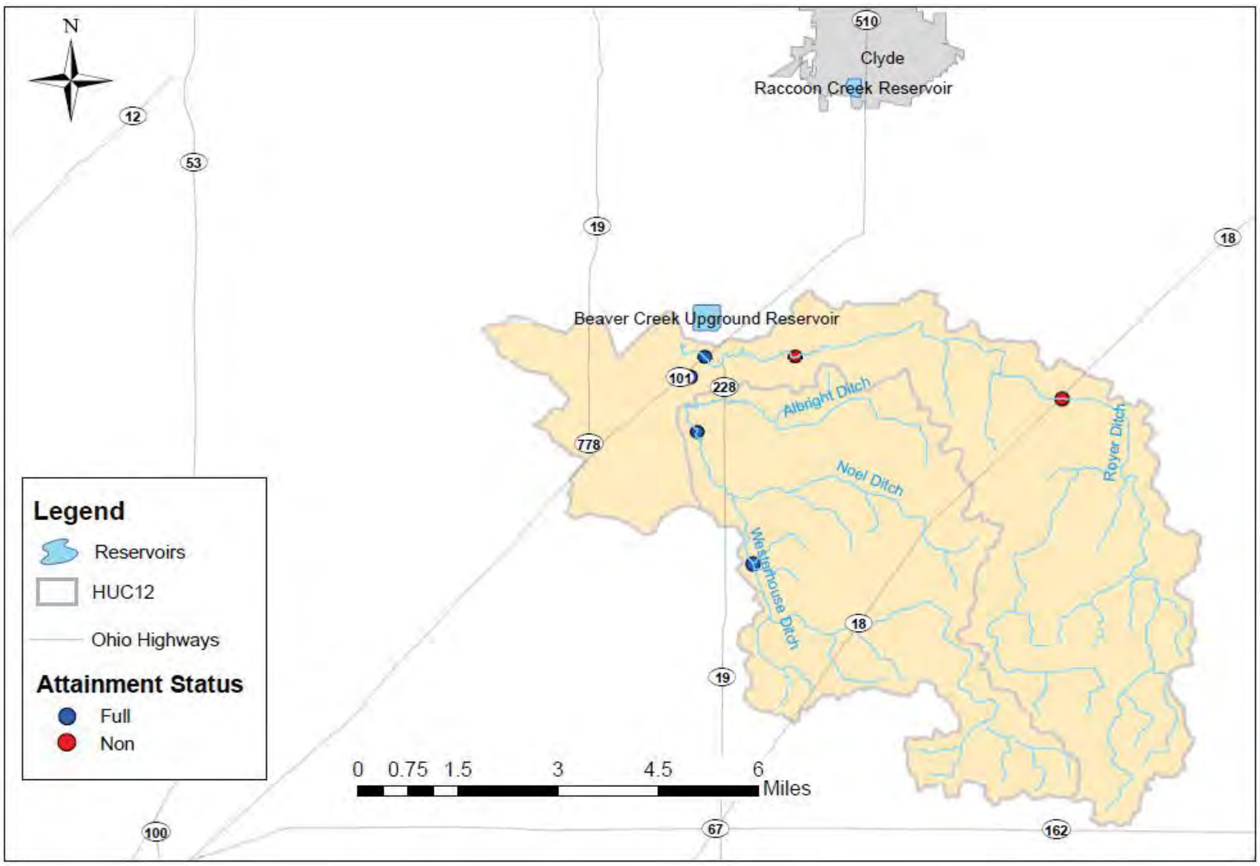

Figure J- 5. Watershed contributing to Beaver Creek Reservoir and the attainment status of sites sampled in 2009.

J3. Addressing Nutrients in Lake Erie

Ohio is working to address its contribution to the problems in Lake Erie through nutrient TMDLs on tributaries; numerous state initiatives to reduce nutrient loads from Ohio; and active participation on

Annex 4 (Nutrients) and other Great Lakes Water Quality Agreement (GLWQA) efforts. Effective lake management and coordinated implementation are needed to address the Western Basin of Lake Erie algal blooms and the Central Basin hypoxia issues, requiring a multi-state and binational effort. Currently, there are a number of parallel planning and management efforts ongoing at the state, federal and binational level. With regard to the open waters of Lake Erie, respecting and working through the binational governance framework is the appropriate process and Ohio intends to aggressively pursue state measures that complement the process and are neither duplicative nor contradictory.

As water quality has improved through the decades, Ohio EPA has addressed most of the significant point source problems and are now left with primarily nonpoint source related impairments. The current Lake Erie algal blooms and Central Basin hypoxic zone are driven by nutrient loading to the Lake. Recent assessments by the Ohio Phosphorus Task Force (Phases I and II) and Annex 4's Objectives and Targets Task team indicate nonpoint sources are the primary source. A key challenge for nutrient management is to assess and manage both in-stream (near-field) and downstream (far-field) impacts in the receiving waterbody (Lake Erie). To improve water quality in Lake Erie, a separate and independent analysis is needed to determine in-lake goals and seasonal/annual load reductions targets for the tributaries. Ohio is directly involved in developing these goals and reduction targets needed for Lake Erie while moving forward on developing implementation strategies and taking action.

Recognizing there may be confusion about the multiple initiatives and how they fit together to improve Lake Erie, an outline and explanation of linkages is provided below.

Great Lakes Water Quality Agreement

Binationally, the U.S. and Canada are working together under the GLWQA to develop nutrient reduction strategies; come to agreement on phosphorus reduction targets for Lake Erie; and create and implement action plans to meet the targets.

<u>Annex 4</u> of the 2012 GLWQA specifically addresses nutrients in the Great Lakes and contains short-term requirements specific for Lake Erie. U.S. EPA has indicated to Ohio that it agrees that the Annex 4 process is the best way to protect Lake Erie for the four states and one province that share the shoreline.

Work under Annex 4 includes the following:

- Develop binational phosphorus loading targets for Lake Erie (by February 2016)
    - Released summer 2015 with public consultation and comment period
    - Final targets/objectives will be included in the binational nutrient management strategy for Lake Erie and will include allocation by country and watershed
- Develop Binational Nutrient Management Strategy (by June 2016), and
- Develop Domestic Action Plans to meet the targets (by April 2018).

<u>Annex 2</u> of the GLWQA provides the framework for long-term binational management of the Lake. A comprehensive LAMP has been developed for Lake Erie and is the binational platform where whole lake management plans are developed, implemented and tracked. Ohio is a key partner in the binational partnership. For example, Annex 2 calls for creation of a new nearshore framework and the binational partnership will be responsible for implementing the framework and reporting on progress. It is also expected that the nutrient targets from Annex 4 will be incorporated in the next version of the lake-wide management plans. Working through the binational partnership is critical for developing a coordinated approach with consistent reporting across the borders.

Great Lakes Commission: Lake Erie Nutrient Targets (LENT) Working Group

The Great Lakes Commission formed the Lake Erie Nutrient Targets (LENT) Working Group as a result of a 2014 resolution that committed the Lake Erie states and the province of Ontario to develop new and refine existing practices, programs and policies to achieve pollutant reduction targets and identify additional remedies to improve water quality in Lake Erie. This is a state/province initiative that is parallel, but separate from the binational GLWQA and Annex 4 efforts. Ohio is a member of the LENT Working Group. The LENT Working Group released a Joint Action Plan for Lake Erie on September 29, 2015, available at http://glc.org/projects/water-quality/lent/.

Lake Erie Collaborative Agreement

The Lake Erie Collaborative Agreement is another state/province led-initiative; it was signed in June 2015 by Ohio, Michigan and Ontario (http://www.cglslgp.org/media/1590/western-basin-of-lake-erie-collaborative-agreement-6-13-15.pdf). The three parties in the agreement are supportive of the binational Annex 4 effort, but recognize that immediate actions can be implemented at the state and provincial levels. In order to get a head start on the Annex 4 process and hasten efforts to improve water quality in Lake Erie, Ohio released a draft Collaborative Implementation Plan in June 2016. The Annex 4 domestic action plans will build on the Collaborative's short-term goals and the implementation plans will become the long-term plans. One of the goals spelled out in the Collaborative Agreement is to reduce nutrient levels going into Lake Erie by 40 percent. The other is to develop a strategic plan to manage dredge material in order to ensure it complies with the state's recent commitment to stop open lake disposal of dredge material into Lake Erie by 2020. The GLWQA does not contain timeframes for implementation and restoration goals, but Ohio is working to meet the Collaborative Agreement phosphorus reduction goals of 20 percent by 2020 and 40 percent by 2025.

TMDLs for Lake Erie Watershed

TMDLs are conducted by the state or federal governments as required under the CWA for waters that have been formally identified as impaired. TMDLs use monitoring and modeling to identify where load reductions and restoration actions are needed. Ohio EPA plans to utilize this tool to target implementation in Ohio's Lake Erie watersheds as it works to meet the Annex 4 phosphorus targets and allocations.

TMDLs are a document that provides guidance on where to focus implementation and recommends BMPs. The TMDL process does not provide additional authority to either Ohio or U.S. EPA to regulate nonpoint sources of pollution; Ohio's regulatory tools are limited to permits and enforcement actions against point sources of pollution.

Ohio has completed TMDLs[8] for 22 of 32 project areas (watersheds) feeding into Lake Erie and work on the remaining 10 watersheds is underway by either Ohio EPA or a contractor for U.S. EPA. All of these TMDLs employ the State's narrative water quality (WQ) criteria for phosphorus with established targets and methods to address "near field" impacts on rivers and streams. Because Ohio lacks a WQS criterion for total phosphorus concentration in Lake Erie, TMDLs were not developed to address the excessive wet weather loads delivered to Lake Erie. Ohio currently assesses the shoreline zone (shoreline out to 100-meters) of Lake Erie and the aquatic life use is designated as impaired by nutrients, among other

[8] While Ohio has completed these TMDLs and they were approved by U.S. EPA, in March 2015 in *Fairfield Cty. Bd. of Commrs. v. Nally,* 143 Ohio St. 3d 93, 2015-Ohio-991, the Ohio Supreme Court determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act." See Section C (page C-17) for more details.

causes.

There have been questions regarding the Chesapeake Bay approach (federally-led multi-state TMDL) and whether it would be appropriate for Lake Erie's Western Basin. The difference is Lake Erie is bordered by another country and already has a binational governance framework (GLWQA) and implementation tool (Annex 4 Domestic Action Plans) in place. Ohio and the other Lake Erie partners are working with U.S. EPA to understand what worked well under the Chesapeake Bay TMDL and build those tools or actions into the Domestic Action Plans. The Annex 4 process of developing loading targets and Domestic Action Plans are essentially identical to the TMDL process but have the added advantage of being binationally managed according to the GLWQA. Key steps in each process are depicted in Figure J-6.

State TMDL VS Binational Annex 4

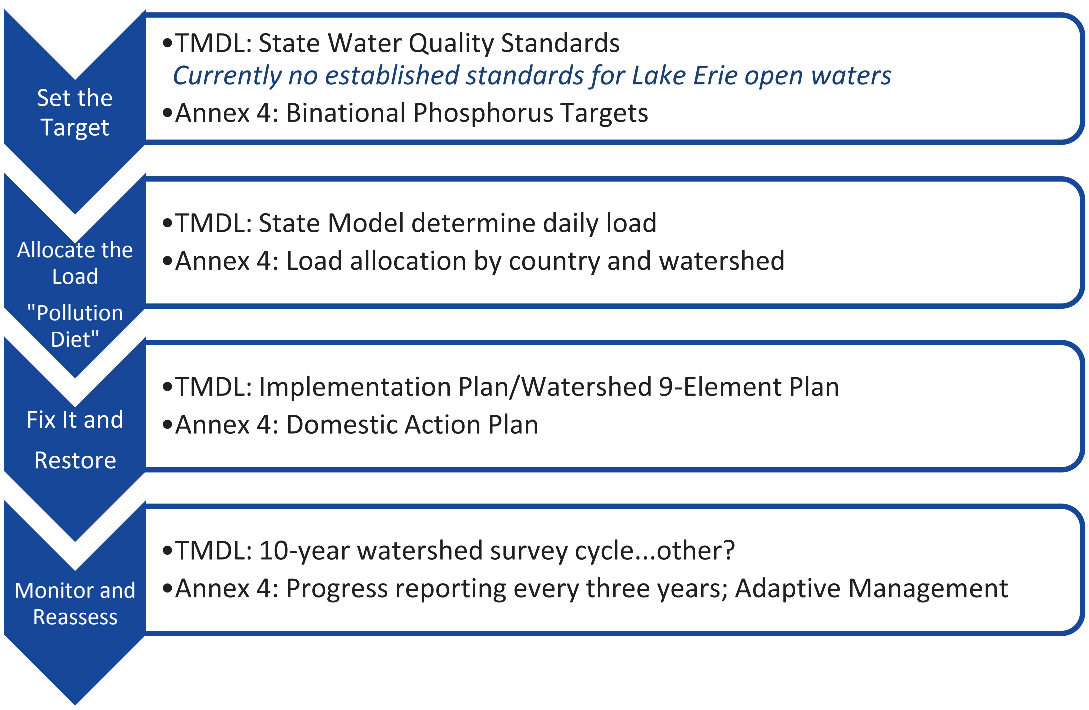

Figure J- 6. Key steps in the state TMDL and binational Annex 4 processes.

Ohio-based Efforts

Ohio EPA's NPS Management Plan ("Plan") is the Agency's guiding document that outlines recommended strategies, goals and objectives for controlling nonpoint sources of water quality impairment. The Plan was most recently updated in 2014 and identifies specific management activities to be implemented by Ohio EPA's NPS management program. The recent algal blooms on Lake Erie, the Ohio River and across the inland waters of Ohio are caused by excessive nutrients and exacerbated by changing weather patterns such as warmer temperatures and more intense storm events. The long-term solution is to reduce sources of nutrients while holistically restoring stream health and improving the waterway's ability to assimilate and utilize nutrients. This is also known as the stream's "assimilative capacity." Restoring stream health will not only reduce the amounts of nutrients that reach the receiving water body, but restoration of in-stream and riparian habitat supports a healthy

ecosystem, builds resilience to climate change impacts and improves recreational opportunities. The most current version of Ohio's NPS Management Plan is available at: http://www.epa.ohio.gov/Portals/35/nps/NPS_Mgmt_Plan.pdf.

Recognizing that Ohio's watersheds provide a significant amount of nutrients to Lake Erie and that its communities are bearing the brunt of algal bloom impacts, Ohio launched a series of initiatives at the state-level back in 2010 and has expanded the scope and scale of implementation; developed a statewide strategy; targeted funding; and undertook legislative action to address the problem. Since 2011, the Ohio has invested more than $1 billion in the Lake Erie watershed to improve drinking water and wastewater facilities; monitor water quality; plant cover crops; recycle dredge material; install controlled drainage systems on fields; and fix failing septic systems. In addition, Ohio has received more than $11 million from the Great Lakes Restoration Fund for water quality improvement efforts in the Lake Erie watershed.

The following is a list of several state-led and statewide water quality improvement activities.

1. **Statewide Nutrient Reduction Strategy:** Ohio's environmental, agricultural and natural resource agencies worked together to create a statewide strategy to reduce nutrient loading to streams and lakes, including Lake Erie. The strategy was submitted to U.S. EPA-Region 5 in 2013. Ohio EPA is currently updating the strategy to address gaps identified through U.S. EPA's review. The strategy and more information about the effort are available at http://www.epa.ohio.gov/dsw/wqs/NutrientReduction.aspx.

2. **GLRI Demonstration and Nutrient Reduction Projects:** Nine grants totaling over $12 million were awarded to Ohio. Highlights include: first saturated buffer installed in Ohio; 53 controlled drainage structures installed; 52 whole farm conservation plans developed; 7,500 acres of cover crops planted; and 29 storm water, wetland and stream restoration projects in Cuyahoga County.

3. **Ohio Senate Bill 1:** This bill, effective July 3, 2015, requires major public-owned treatment works (POTWs) to conduct technical and financial capability studies to achieve 1.0 mg/L total phosphorus; establishes regulations for fertilizer or manure application for persons in the western basin[9]; designates the director of Ohio EPA as coordinator of harmful algae management and response and requires the director to implement actions that protect against cyanobacteria in the western basin and public water supplies; prohibits the director of Ohio EPA from issuing permits for sludge management that allow placement of sewage sludge on frozen ground; and prohibits the deposit of dredged material in Lake Erie on or after July 1, 2020, with some exceptions.

[9] "Western basin" is defined in this Senate Bill as consisting of the following 11 watersheds: Ottawa watershed, HUC 04100001; River Raisin watershed, HUC 04100002; St. Joseph watershed, HUC 04100003; St. Mary's watershed, HUC 04100004; Upper Maumee watershed, HUC 04100005; Tiffin watershed, HUC 04100006; Auglaize watershed, HUC 04100007; Blanchard watershed, HUC 04100008; Lower Maumee watershed, HUC 04100009; Cedar-Portage watershed, HUC 04100010; and Sandusky watershed, HUC 04100011.

4. **Ohio Senate Bill 150**: This bill, effective August 21, 2014, requires, among other things, that beginning September 31, 2017, fertilizer applicators must be certified and educated on the handling and application of fertilizer; and authorizes a person who owns or operates agricultural land to develop a voluntary nutrient management plan or request that one be developed for him or her.

5. **Ohio HB 64**: This bill, effective June 30, 2015, requires the development of a biennial report by spring 2016 on mass loading of nutrients delivered to Lake Erie and the Ohio River from Ohio's point and nonpoint sources. A summary of the bill is available at https://www.legislature.ohio.gov/legislation/legislation-summary?id=GA131-HB-64.

6. **Ohio Clean Lakes Initiative:** The Ohio General Assembly provided more than $3.5 million for projects to reduce nutrient runoff in the Western Lake Erie Basin.

7. **Healthy Lake Erie Initiative**: The Ohio General Assembly provided $10 million to the Healthy Lake Erie Initiative to reduce the open lake placement of dredge material into Lake Erie. These sediments often contain high levels of nutrients or other contaminants so finding alternative use or disposal options is a priority.

8. **Targeted Funding to Ohio Drinking Water and WWTPs**: More than $150 million was made available starting in 2014 to help public water systems keep drinking water safe and to help wastewater treatment plants reduce the amount of phosphorus they discharge into the Lake Erie watershed. As of June 2016, over $61 million had been awarded for this work and most of the remainder has been allocated for specific projects.

9. **Directors' Agricultural Nutrients and Water Quality Working Group:** This is a collaborative working group that consists of participants from Ohio EPA, ODA and ODNR. The group's report contains a number of recommendations to be implemented during the next several years. For example, the report recommends ways for farmers to better manage fertilizers and animal manure and also provides the state with the means to assist farmers in the development of nutrient management plans and to exert more regulatory authority over the farmers who are not following the rules. The report is available at http://www.agri.ohio.gov/topnews/waterquality/docs/FINAL_REPORT_03-09-12.pdf.

10. **Ohio Lake Erie Phosphorus Task Force Phase 2**: The Task Force, which includes participants from Ohio EPA, ODA and ODNR, originally met back in 2009 and was brought back together in 2012 to build on its previous work and make recommendations for improving water quality in the Lake Erie watershed. The taskforce finalized the latest report in 2014 and it is available at http://lakeerie.ohio.gov/Portals/0/Reports/Task_Force_Report_October_2013.pdf.

11. **Ohio Point Source and Urban Runoff Workgroup:** Businesses, municipalities and Ohio EPA came together to initiate the "Point Source and Urban Runoff Workgroup" in 2012 in order to identify actions that can be taken immediately to reduce phosphorus loadings from WWTPs, industrial discharges and urban storm water. The group's full report is available at http://epa.ohio.gov/portals/35/documents/point_source_workgroup_report.pdf.

J4. Summary of Results

The consolidated results of the 2016 analysis are shown in Table J-4 and Figures J-7 through J-9. Compared with past reports, the number of TMDLs continues to rise and the number of units with an "unknown" condition continues to decrease.

Table J-4. Summary of results for each beneficial use[10]

	Human Health (Fish Contaminants)	Recreation	Aquatic Life	Public Drinking Water Supply
Watershed assessment units				
Not being used for public water supply	0	0	0	1427
Attains	218	153	420	39
Unknown	893	252	172	51
Impaired, needs TMDL	427	685	434	20
Impaired, TMDL complete	0	448	415	1
Impaired, other remedy	0	0	0	0
Impaired, not pollutant	0	0	13	0
Impaired, natural condition	0	0	84	0
Total watershed units evaluated	1538	1538	1538	1538
Large river assessment units				
Not being used for public water supply	0	0	0	29
Attains	1	4	18	1
Unknown	2	6	0	4
Impaired, needs TMDL	35	23	12	4
Impaired, TMDL complete	0	5	5	0
Impaired, other remedy	0	0	0	0
Impaired, not pollutant	0	0	3	0
Total large river units evaluated	38	38	38	38
Lake Erie assessment units				
Attains	0	1	0	0
Unknown	0	0	0	0
Impaired, needs TMDL	3	2	3	3
Total Lake Erie units evaluated	3	3	3	3

[10] Reported using federally-defined categories (see Table J-1), except for two defined by Ohio [category 0 (not being used for public water supply) and subcategory 4n (impaired due to natural condition)]. Other Ohio-defined subcategories are included in federal categories

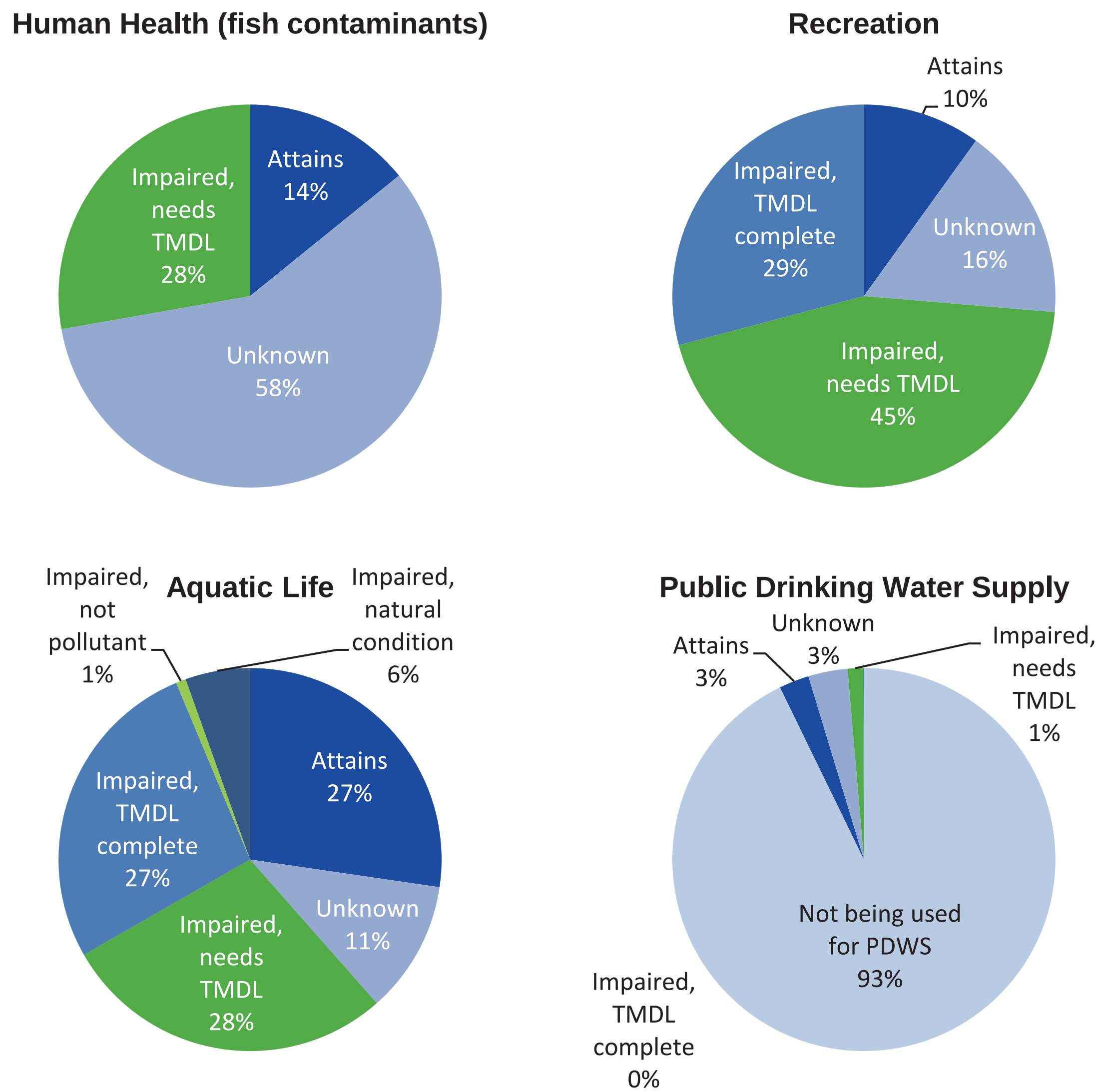

Figure J-7. Summary of 2016 IR results for watershed AUs by beneficial use.

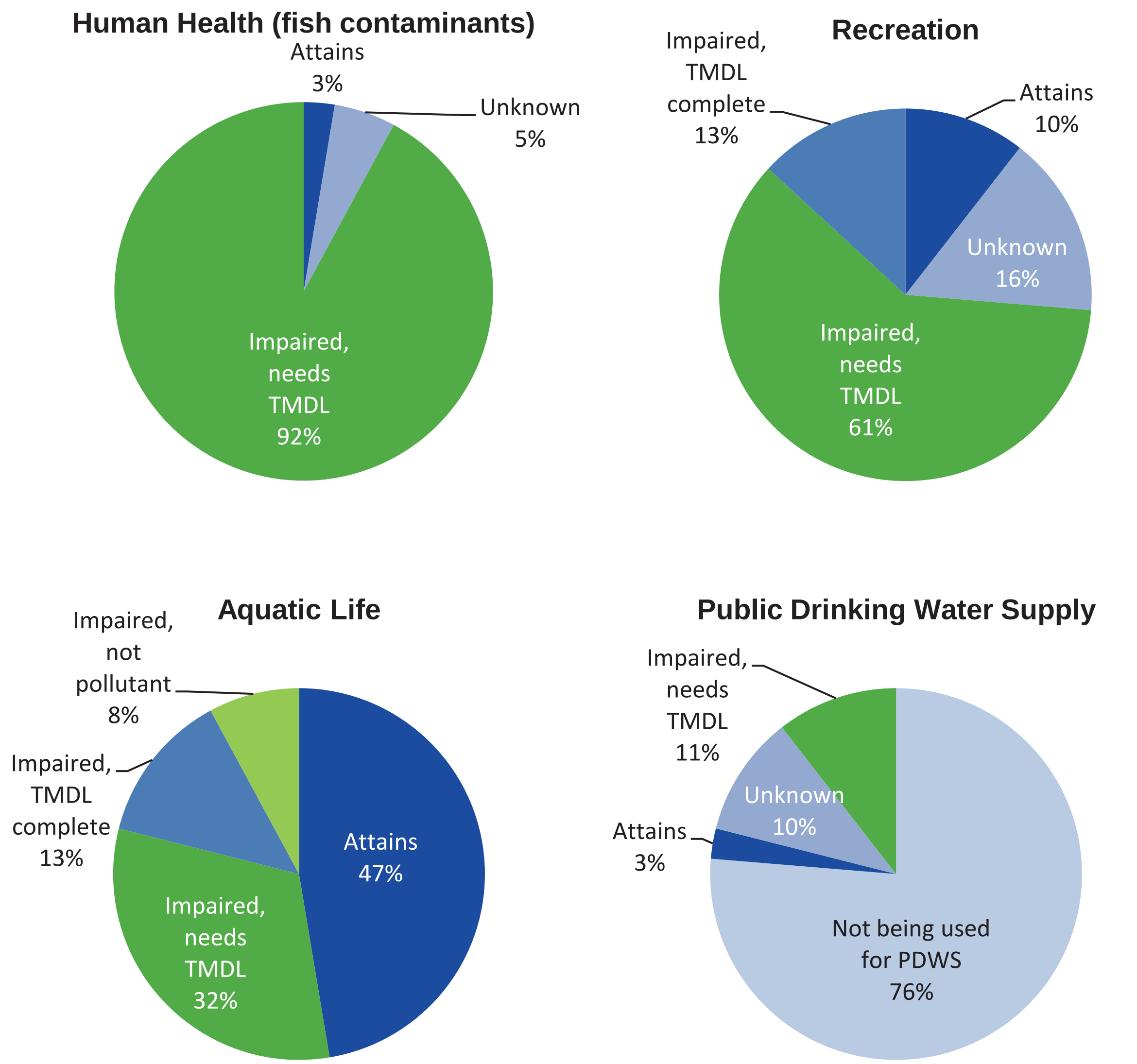

Figure J-8. Summary of 2016 IR results for large river AUs by beneficial use.

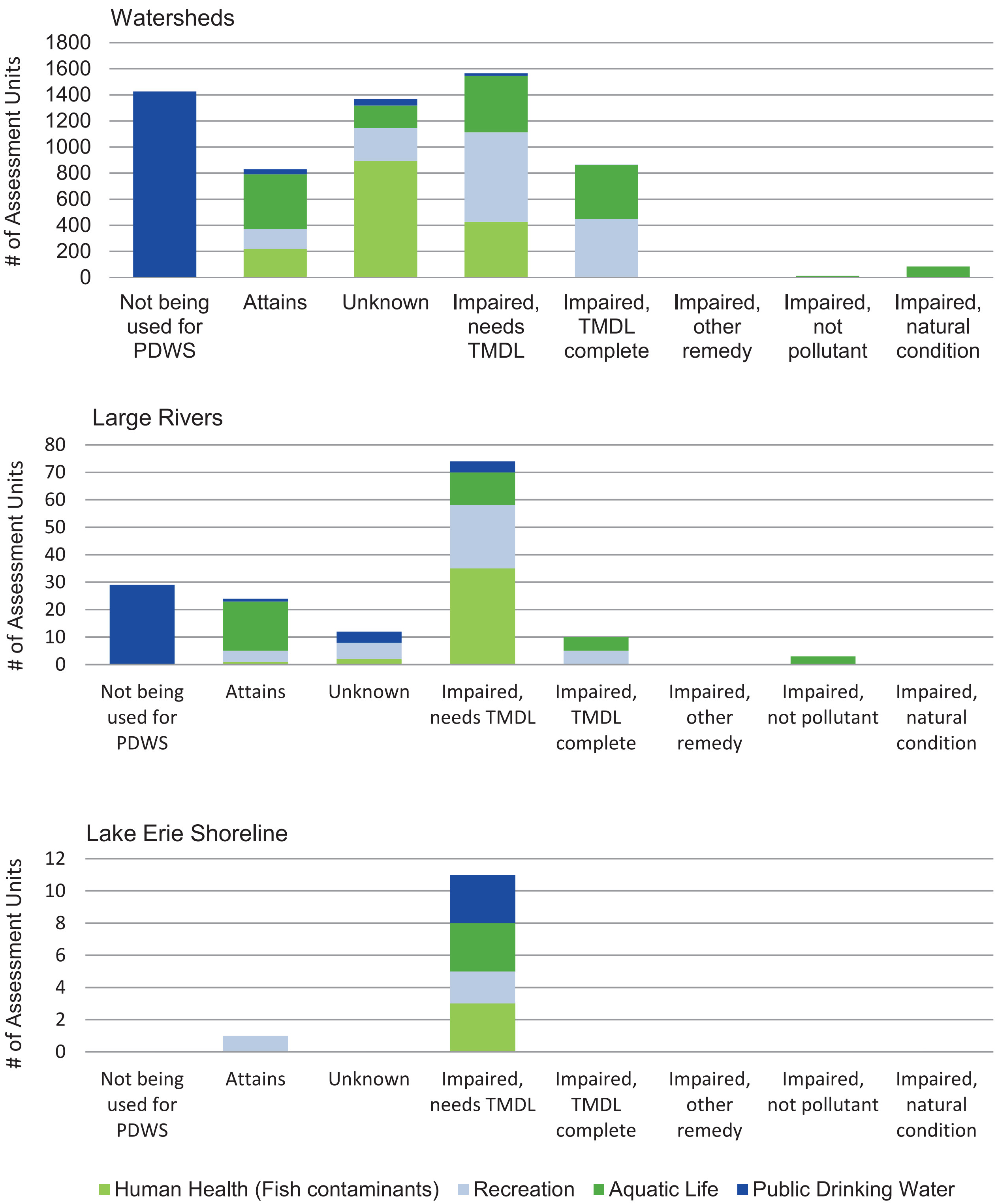

Figure J-9. Summary of 2016 results by AU type.

J5. Changes to the 2014 303(d) List

Federal regulations require a demonstration of good cause for not including water bodies on the Section 303(d) list that were included on previous 303(d) lists (40 CFR 130.7(b)(6)(iv)). Over time, U.S. EPA has modified the wording of reasons for delisting in guidance (U.S. EPA 2005, 2006, 2009, 2011, 2013) to be used in preparing this report. Ohio is removing 132 AUs and adding 329 AUs based on one of these three reasons:

- Flaw in original listing: reason noted for each change. Most of the changes are for the aquatic life use and are due to a reevaluation of the AU and lack of data (sampling and historical) in order to make an assessment. In one instance, an AU (Chapman Creek – 05080001 16 06) was assigned a Category 5 ranking under "flaw in original listing" because the impairment was documented due to an unknown cause and source even though a TMDL had been completed and approved by U.S. EPA
- New data: the assessment and interpretation of more recent data
- TMDL approved[11]: approval by U.S. EPA of a TMDL.

Table J-5 summarizes the number of watershed, large river and Lake Erie shoreline AUs being removed from the 2014 303(d) list. Table J-6 and Figure J-6 summarize the number of AUs being changed for each of the three reasons. Each AU removed or added for each reason is presented in Tables J-7 through J-12.

Table J-5. Number of AUs removed from or added to the 303(d) list.

	Number of AUs			
	Watershed	**Large River**	**Lake Erie**	***Total***
Delistings [Remove from 303(d) list]				
Human Health (fish tissue)	15	0	0	15
Recreation	37	1	0	38
Aquatic Life	76	2	0	78
Public Drinking Water Supply	1	0	0	1
Total	130	3	0	132
New Listings [Add to 303(d) list]				
Human Health (fish tissue)	21	0	0	21
Recreation	261	3	0	264
Aquatic Life	31	0	0	31
Public Drinking Water Supply	11	0	2	13
Total	326	3	2	329

[11] While Ohio has completed these TMDLs and they were approved by U.S. EPA, in March 2015 in *Fairfield Cty. Bd. of Commrs. v. Nally,* 143 Ohio St. 3d 93, 2015-Ohio-991, the Ohio Supreme Court determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act." See Section C (page C-17) for more details.

Table J-6. Summary of reasons for changes to the 2014 303(d) list.

Reason for Change	Number of AUs Removals	Number of AUs Additions
Flaw in original listing	7	1
New data	72	328
TMDL approved	53	--
Total	***132***	***329***

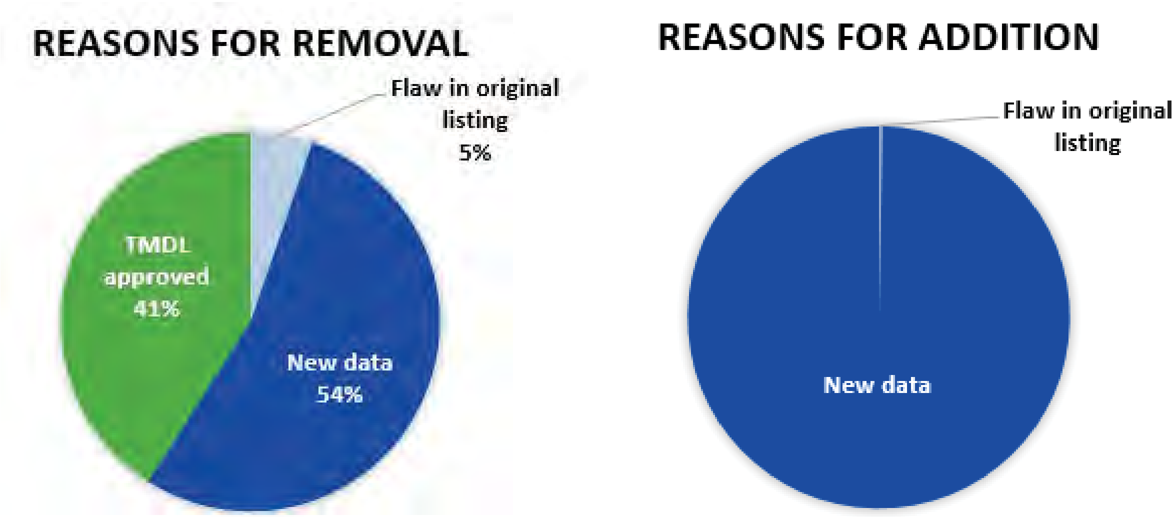

Figure J-10. Summary of reasons for changes to the 2014 303(d) list.

Table J-7. Removals from 303(d) list because of flaw in original listing.

Use	AU Number	AU Name	2014 Category	2016 Category
ALU	04100003 05 06	Sol Shank Ditch-St Joseph River	5hx	3
ALU	04100006 02 01	Silver Creek-Bean Creek	5hx	3
ALU	04100007 12 04	Brown Ditch-Flatrock Creek	5hx	3
ALU	05030103 08 08	Hickory Run	5hx	3
ALU	05090203 02 01	Town of Newport-Ohio River	5hx	3
ALU	05090203 02 04	Garrison Creek-Ohio River	5hx	3
PDWS	04100007 03 06	Lima Reservoir-Ottawa River	5	3

Table J-8. Removals from the 303(d) list because of new data.

Use	AU Number	AU Name	2014 Category	2016 Category
ALU	04100003 03 02	Cogswell Cemetery-St Joseph River	5hx	1
ALU	04100003 03 04	Village of Montpelier-St Joseph River	5hx	1
ALU	04100003 03 05	Bear Creek	5hx	1
ALU	04100003 03 06	West Buffalo Cemetery-St Joseph River	5hx	1
ALU	04100003 04 02	Headwaters Fish Creek	5h	1
ALU	04100003 04 06	Cornell Ditch-Fish Creek	5	1
ALU	04100003 05 01	Bluff Run-St Joseph River	5hx	1
ALU	04100003 05 02	Big Run	5hx	1

Use	AU Number	AU Name	2014 Category	2016 Category
ALU	04100003 05 03	Russell Run-St Joseph River	5hx	1
ALU	04100003 05 05	Willow Run-St Joseph River	5hx	1
ALU	04100006 02 03	Old Bean Creek	5hx	1
ALU	04100006 02 05	Stag Run-Bean Creek	5hx	1
ALU	04100006 04 04	Lower Lick Creek	5hx	1
ALU	04100006 05 03	Village of Stryker-Tiffin River	5hx	1
ALU	04100006 05 04	Coon Creek-Tiffin River	5hx	4n
ALU	04100006 06 03	Webb Run	5hx	4n
ALU	04100006 06 04	Buckskin Creek-Tiffin River	5hx	4n
ALU	04100007 12 01	Headwaters Flatrock Creek	5hx	1
ALU	04100007 12 08	Sixmile Creek	5hx	1
ALU	04110001 01 04	Mallet Creek	5hx	1
ALU	04110001 01 05	City of Medina-West Branch Rocky River	5hx	1
ALU	04110001 01 06	Cossett Creek-West Branch Rocky River	5hx	4n
ALU	04110001 02 01	Headwaters East Branch Rocky River	5hx	1
ALU	05030103 05 01	Upper Mosquito Creek	5hx	4n
ALU	05030103 05 02	Middle Mosquito Creek	5hx	1
ALU	05030103 07 01	Upper Meander Creek	5	4n
ALU	05030103 07 02	Middle Meander Creek	5	4n
ALU	05030103 07 05	Little Squaw Creek-Mahoning River	5hx	4C
ALU	05030103 08 04	Crab Creek	5	1
ALU	05030103 08 07	Dry Run-Mahoning River	5hx	4n
ALU	05040004 07 01	Mans Fork	5hx	1
ALU	05040004 07 02	Headwaters Meigs Creek	5hx	1
ALU	05040004 07 03	Dyes Fork	5hx	1
ALU	05040004 07 04	Fourmile Run-Meigs Creek	5hx	1
ALU	05040004 09 01	South West Branch Wolf Creek	5x	1
ALU	05040004 10 01	Headwaters West Branch Wolf Creek	5x	4n
ALU	05040004 10 02	Aldridge Run-West Branch Wolf Creek	5x	1
ALU	05040004 10 03	Coal Run	5x	1
ALU	05040005 02 01	Yoker Creek	5hx	1
ALU	05040005 04 01	Brushy Fork	5hx	1
ALU	05040005 04 03	Clear Fork	5hx	1
ALU	05040005 04 04	Rocky Fork	5hx	1
ALU	05040005 04 05	Salt Fork Lake-Sugartree Fork	5hx	1
ALU	05090201 02 01	Headwaters Turkey Creek	5hx	4n
ALU	05090201 02 02	Odell Creek-Turkey Creek	5hx	1
ALU	05090201 12 01	Headwaters Big Indian Creek	5hx	4n
ALU	05090201 12 02	North Fork Indian Creek-Big Indian Creek	5hx	1
ALU	05090201 12 03	Boat Run-Ohio River	5hx	1
ALU	05090201 12 04	Ferguson Run-Twelvemile Creek	5hx	4n
ALU	05090201 12 06	Tenmile Creek	5hx	1
HH	04100001 03 04	Headwaters Tenmile Creek	5h	1
HH	04100004 03 03	Yankee Run-St Marys River	5h	1
HH	04100006 03 01	Bates Creek-Tiffin River	5h	1
HH	04100010 02 02	East Branch Portage River	5h	1

Use	AU Number	AU Name	2014 Category	2016 Category
HH	04110001 01 05	City of Medina-West Branch Rocky River	5h	1
HH	04110001 02 01	Headwaters East Branch Rocky River	5h	1
HH	04110001 02 02	Baldwin Creek-East Branch Rocky River	5h	1
HH	04110001 04 01	Town of Litchfield-East Branch Black River	5h	1
HH	04110001 04 02	Salt Creek-East Branch Black River	5h	1
HH	05030101 08 01	Town Fork	5h	1
HH	05030101 10 04	McIntyre Creek	5h	1
HH	05030103 03 05	Town of Newton Falls-West Branch Mahoning River	5h	1
HH	05030103 04 05	Mouth Eagle Creek	5h	1
HH	05060001 19 02	Spain Creek-Big Darby Creek	5h	1
HH	05060001 19 05	Robinson Run-Big Darby Creek	5h	1
RU	04100011 90 02	Sandusky River Mainstem (Wolf Creek to Sandusky Bay)	5	1d
RU	05030106 03 02	Headwaters Wheeling Creek	5	1
RU	05040001 06 07	Beal Run-Sandy Creek	5	1
RU	05040001 15 03	Upper Little Stillwater Creek	5	1
RU	05040002 02 01	Village of Pavonia-Black Fork Mohican River	5	1
RU	05040003 05 02	Little Killbuck Creek-Killbuck Creek	5	1
RU	05090103 02 05	Lick Run-Pine Creek	5	1

Table J-9. Removals from the 303(d) list because of TMDL approved[12].

Use	AU Number	AU Name	2014 Category	2016 Category
ALU	04100007 03 03	Little Hog Creek	5	4A
ALU	04100007 03 04	Lower Hog Creek	5	4A
ALU	04100007 03 05	Lost Creek	5	4A
ALU	04100007 04 01	Little Ottawa River	5	4A
ALU	04100007 04 03	Honey Run	5	4A
ALU	04100011 01 02	Pipe Creek-Frontal Sandusky Bay	5	4A
ALU	04100011 01 03	Mills Creek	5	4A
ALU	04100011 02 01	Frontal South Side of Sandusky Bay	5	4A
ALU	04100011 02 03	Pickerel Creek	5	4A
ALU	04100011 02 05	South Creek	5	4A
ALU	04100011 10 01	East Branch East Branch Wolf Creek	5	4A
ALU	04100011 10 02	Town of New Riegel-East Branch Wolf Creek	5	4A
ALU	04100011 10 04	Wolf Creek	5	4A
ALU	04100011 11 05	Spicer Creek-Sandusky River	5	4A
ALU	04100011 12 02	Beaver Creek	5	4A
ALU	04100011 12 03	Green Creek	5	4A
ALU	04100011 13 01	Muskellunge Creek	5	4A
ALU	04100011 13 03	Mouth Sandusky River	5	4A
ALU	04100011 14 03	Little Muddy Creek	5	4A

[12] While Ohio has completed these TMDLs and they were approved by U.S. EPA, in March 2015 in *Fairfield Cty. Bd. of Commrs. v. Nally,* 143 Ohio St. 3d 93, 2015-Ohio-991, the Ohio Supreme Court determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act." See Section C (page C-17) for more details.

Use	AU Number	AU Name	2014 Category	2016 Category
ALU	04100011 14 04	Town of Lindsey-Muddy Creek	5	4A
ALU	04100011 90 01	Sandusky River Mainstem (Tymochtee Creek to Wolf Creek)	5	4A
ALU	04100011 90 02	Sandusky River Mainstem (Wolf Creek to Sandusky Bay)	5	4A
RU	04100007 03 02	Middle Hog Creek	5	4A
RU	04100007 03 03	Little Hog Creek	5	4A
RU	04100007 03 04	Lower Hog Creek	5	4A
RU	04100007 03 05	Lost Creek	5	1d
RU	04100007 03 06	Lima Reservoir-Ottawa River	5	4A
RU	04100007 04 01	Little Ottawa River	5	4A
RU	04100007 04 02	Dug Run-Ottawa River	5	4A
RU	04100007 04 03	Honey Run	5	4A
RU	04100007 04 04	Pike Run	5	4A
RU	04100007 04 05	Leatherwood Ditch	5	4A
RU	04100007 04 06	Beaver Run-Ottawa River	5	4A
RU	04100007 05 01	Sugar Creek	5	4A
RU	04100007 05 02	Plum Creek	5	4A
RU	04100007 05 03	Village of Kalida-Ottawa River	5	4A
RU	04100011 01 01	Sawmill Creek	5	4A
RU	04100011 01 02	Pipe Creek-Frontal Sandusky Bay	5	4A
RU	04100011 02 01	Frontal South Side of Sandusky Bay	5	4A
RU	04100011 02 02	Strong Creek	5	4A
RU	04100011 02 03	Pickerel Creek	5	4A
RU	04100011 02 04	Raccoon Creek	5	4A
RU	04100011 02 05	South Creek	5	4A
RU	04100011 10 01	East Branch East Branch Wolf Creek	5	4Ah
RU	04100011 10 02	Town of New Riegel-East Branch Wolf Creek	5	4Ah
RU	04100011 10 03	Snuff Creek-East Branch Wolf Creek	5	4Ah
RU	04100011 10 04	Wolf Creek	5	4A
RU	04100011 12 01	Westerhouse Ditch	5	4Ah
RU	04100011 12 02	Beaver Creek	5	4Ah
RU	04100011 13 01	Muskellunge Creek	5	4Ah
RU	04100011 13 02	Indian Creek-Sandusky River	5	4Ah
RU	04100011 14 02	Town of Helena-Muddy Creek	5	4Ah
RU	04100011 14 04	Town of Lindsey-Muddy Creek	5	4Ah

Table J-10. Addition to the 303(d) list because of flaw in original listing

Use	AU Number	AU Name	2014 Category	2016 Category
ALU	05080001 16 06	Chapman Creek	4A	5

Table J-12. Additions to the 303(d) list because of new data.

Use	AU Number	AU Name	2014 Category	2016 Category
ALU	04100003 02 04	West Branch St Joseph River	3x	5
ALU	04100007 08 02	Upper Town Creek	3x	5

Use	AU Number	AU Name	2014 Category	2016 Category
ALU	04100007 10 01	Upper Prairie Creek	3x	5
ALU	04100007 10 04	Lower Blue Creek	3x	5
ALU	04100007 10 05	Town of Charloe-Auglaize River	3x	5
ALU	04110002 03 03	Wingfoot Lake outlet-Little Cuyahoga River	4Ah	5
ALU	04110003 04 02	Griswold Creek-Chagrin River	4A	5
ALU	05030103 06 01	Duck Creek	3x	5
ALU	05030103 06 02	Mud Creek	3x	5
ALU	05030103 06 03	City of Warren-Mahoning River	3x	5
ALU	05030204 04 02	Baldwin Run	1t	5
ALU	05040004 08 06	Oilspring Run-Muskingum River	3x	5
ALU	05040004 09 03	Plumb Run-South Branch Wolf Creek	4n	5
ALU	05040004 11 04	Reasoners Run-Olive Green Creek	3x	5
ALU	05040004 11 05	Congress Run-Muskingum River	3x	5
ALU	05040005 01 02	Beaver Creek	3x	5
ALU	05040005 01 03	Glady Run-Seneca Fork	3x	5
ALU	05040005 01 05	Opossum Run-Seneca Fork	3x	5
ALU	05040005 03 01	Headwaters Leatherwood Creek	3x	5
ALU	05040005 05 02	Headwaters Crooked Creek	3x	5
ALU	05040005 05 03	Peters Creek-Crooked Creek	3x	5
ALU	05040005 05 07	Johnson Fork-Birds Run	3x	5
ALU	05040005 05 08	Wolf Run-Wills Creek	3x	5
ALU	05040005 06 01	Bacon Run	3x	5
ALU	05040005 06 02	Twomile Run-Wills Creek	3x	5
ALU	05060001 07 04	Moors Run-Scioto River	3t	5
ALU	05060001 15 01	Rocky Fork Creek	4Ah	5
ALU	05060001 15 04	Town of Brice-Blacklick Creek	4A	5d
ALU	05080001 11 01	Mud Creek	4Ah	5d
ALU	05090201 11 04	Bullskin Creek	3x	5
HH	04100003 02 04	West Branch St Joseph River	1h	5
HH	04100006 05 03	Village of Stryker-Tiffin River	3	5
HH	04100007 02 04	Sixmile Creek-Auglaize River	1h	5
HH	04100007 08 01	Dog Creek	3	5
HH	04100007 08 04	Lower Town Creek	1	5
HH	04100007 12 06	Big Run-Flatrock Creek	3i	5
HH	04100012 06 06	Huron River-Frontal Lake Erie	3	5
HH	04110001 01 08	Baker Creek-West Branch Rocky River	1	5
HH	04110002 01 04	Ladue Reservoir-Bridge Creek	1	5
HH	04110002 04 05	Boston Run-Cuyahoga River	3	5
HH	05030103 03 04	Kirwin Reservoir-West Branch Mahoning River	1h	5
HH	05030103 05 03	Lower Mosquito Creek	3	5
HH	05030103 07 03	Lower Meander Creek	1h	5
HH	05040006 06 03	Dillon Lake-Licking River	1h	5
HH	05060001 02 03	Dudley Run-Rush Creek	3i	5
HH	05060001 22 03	Greenbrier Creek-Big Darby Creek	1h	5
HH	05060002 02 05	Deer Creek Lake-Deer Creek	1	5
HH	05060002 16 02	Big Run-Scioto River	3	5

Use	AU Number	AU Name	2014 Category	2016 Category
HH	05080001 11 03	Dividing Branch-Greenville Creek	3	5
HH	05090103 01 04	Storms Creek	1	5
HH	05090103 06 05	Wards Run-Little Scioto River	3	5
PDWS	04100007 04 03	Honey Run	3i	5
PDWS	04100009 03 02	Lower Bad Creek	3	5
PDWS	04100009 06 03	Haskins Road Ditch-Maumee River	3i	5
PDWS	04100011 02 04	Raccoon Creek	1	5
PDWS	04100011 12 02	Beaver Creek	1	5
PDWS	04100011 12 03	Green Creek	3i	5
PDWS	04100012 06 03	Norwalk Creek	3i	5
PDWS	05030201 01 01	Upper Sunfish Creek	3	5
PDWS	05040001 01 04	Wolf Creek	3	5
PDWS	05040001 15 03	Upper Little Stillwater Creek	1	5
PDWS	05090201 08 02	Headwaters Straight Creek	3i	5
PDWS	24001 002	Lake Erie Central Basin Shoreline	1	5
PDWS	24001 003	Lake Erie Islands Shoreline	1	5
RU	04100003 01 06	Clear Fork-East Branch St Joseph River	3	5
RU	04100003 02 04	West Branch St Joseph River	3	5
RU	04100003 03 01	Nettle Creek	3	5
RU	04100003 03 02	Cogswell Cemetery-St Joseph River	3	5
RU	04100003 03 03	Eagle Creek	3	5
RU	04100003 03 04	Village of Montpelier-St Joseph River	1	5
RU	04100003 03 06	West Buffalo Cemetery-St Joseph River	3	5
RU	04100003 04 02	Headwaters Fish Creek	3	5
RU	04100003 04 06	Cornell Ditch-Fish Creek	3	5
RU	04100003 05 01	Bluff Run-St Joseph River	3	5
RU	04100003 05 02	Big Run	3	5
RU	04100003 05 03	Russell Run-St Joseph River	3	5
RU	04100004 01 01	Muddy Creek	3	5
RU	04100004 01 02	Center Branch St Marys River	3	5
RU	04100004 01 03	East Branch St Marys River	3	5
RU	04100004 01 04	Kopp Creek	1	5
RU	04100004 01 05	Sixmile Creek	3	5
RU	04100004 02 01	Hussey Creek	3	5
RU	04100004 02 03	Blierdofer Ditch	3	5
RU	04100004 02 04	Twelvemile Creek	3i	5
RU	04100004 02 05	Prairie Creek-St Marys River	3i	5
RU	04100004 03 01	Little Black Creek	3	5
RU	04100004 03 02	Black Creek	3	5
RU	04100004 03 03	Yankee Run-St Marys River	3i	5
RU	04100004 03 04	Duck Creek	3	5
RU	04100004 03 05	Town of Willshire-St Marys River	3	5
RU	04100004 04 01	Twentyseven Mile Creek	3	5
RU	04100005 02 01	Zuber Cutoff	3	5
RU	04100005 02 03	Marie DeLarme Creek	3	5
RU	04100005 02 04	Gordon Creek	3	5

Use	AU Number	AU Name	2014 Category	2016 Category
RU	04100005 02 06	Platter Creek	3	5
RU	04100005 02 07	Sulphur Creek-Maumee River	3	5
RU	04100005 02 08	Snooks Run-Maumee River	3	5
RU	04100006 02 04	Mill Creek	3	5
RU	04100006 02 05	Stag Run-Bean Creek	3	5
RU	04100006 03 01	Bates Creek-Tiffin River	3	5
RU	04100006 04 01	Upper Lick Creek	3	5
RU	04100006 04 02	Middle Lick Creek	3	5
RU	04100006 04 03	Prairie Creek	3	5
RU	04100006 04 04	Lower Lick Creek	3	5
RU	04100006 05 01	Beaver Creek	3	5
RU	04100006 05 04	Coon Creek-Tiffin River	3	5
RU	04100006 06 01	Lost Creek	3	5
RU	04100006 06 02	Mud Creek	3	5
RU	04100006 06 03	Webb Run	3	5
RU	04100007 02 04	Sixmile Creek-Auglaize River	1t	5
RU	04100007 06 01	Kyle Prairie Creek	3	5
RU	04100007 06 02	Long Prairie Creek-Little Auglaize River	1	5
RU	04100007 06 03	Wolf Ditch-Little Auglaize River	3	5
RU	04100007 07 01	Hagarman Creek	3	5
RU	04100007 07 02	West Branch Prairie Creek	3	5
RU	04100007 08 01	Dog Creek	3	5
RU	04100007 08 02	Upper Town Creek	3	5
RU	04100007 08 03	Maddox Creek	3	5
RU	04100007 08 04	Lower Town Creek	3	5
RU	04100007 10 01	Upper Prairie Creek	3	5
RU	04100007 10 02	Upper Blue Creek	3	5
RU	04100007 10 03	Middle Blue Creek	3	5
RU	04100007 10 04	Lower Blue Creek	3	5
RU	04100007 10 05	Town of Charloe-Auglaize River	3	5
RU	04100007 12 01	Headwaters Flatrock Creek	3	5
RU	04100007 12 05	Wildcat Creek-Flatrock Creek	3	5
RU	04100007 12 06	Big Run-Flatrock Creek	1	5
RU	04100007 12 07	Little Flatrock Creek	3	5
RU	04100007 12 08	Sixmile Creek	3	5
RU	04100007 12 09	Eagle Creek-Auglaize River	1	5
RU	04100009 01 01	West Creek	3	5
RU	04100009 01 02	Upper South Turkeyfoot Creek	3i	5
RU	04100009 01 03	School Creek	3	5
RU	04100009 01 04	Middle South Turkeyfoot Creek	3	5
RU	04100009 01 05	Little Turkeyfoot Creek	3	5
RU	04100009 01 06	Lower South Turkeyfoot Creek	3	5
RU	04100009 02 02	Benien Creek	3	5
RU	04100009 02 03	Wade Creek-Maumee River	3	5
RU	04100009 02 04	Garret Creek	3	5
RU	04100009 02 05	Oberhaus Creek	3	5

Use	AU Number	AU Name	2014 Category	2016 Category
RU	04100009 02 06	Village of Napoleon-Maumee River	3	5
RU	04100009 02 07	Creager Cemetery-Maumee River	3	5
RU	04100009 03 02	Lower Bad Creek	3i	5
RU	04100009 04 03	Dry Creek-Maumee River	3i	5
RU	04100009 05 01	Big Creek	3	5
RU	04100009 05 02	Hammer Creek	3	5
RU	04100009 05 03	Upper Beaver Creek	3	5
RU	04100009 05 05	Brush Creek	3i	5
RU	04100009 05 07	Cutoff Ditch	3	5
RU	04100009 05 08	Middle Beaver Creek	3	5
RU	04100009 06 01	Tontogany Creek	3	5
RU	04100009 06 02	Sugar Creek-Maumee River	3	5
RU	04100011 06 04	Spring Run	3	5
RU	04100011 08 05	Middle Honey Creek	3	5
RU	04100011 09 03	Greasy Run-Sycamore Creek	3i	5
RU	04100012 01 03	Southwest Branch Vermilion River	3	5
RU	04110001 01 01	Plum Creek	3	5
RU	04110001 01 02	North Branch West Branch Rocky River	3	5
RU	04110001 01 03	Headwaters West Branch Rocky River	3	5
RU	04110001 01 05	City of Medina-West Branch Rocky River	3	5
RU	04110001 01 07	Plum Creek	3	5
RU	04110001 01 08	Baker Creek-West Branch Rocky River	3	5
RU	04110001 02 01	Headwaters East Branch Rocky River	3	5
RU	04110001 02 02	Baldwin Creek-East Branch Rocky River	1	5
RU	04110001 02 04	Cahoon Creek-Frontal Lake Erie	3	5
RU	04110001 07 01	Headwaters Beaver Creek	3	5
RU	04110001 07 03	Quarry Creek-Frontal Lake Erie	3	5
RU	04110002 01 02	West Branch Cuyahoga River	3	5
RU	04110002 02 01	Potter Creek-Breakneck Creek	3	5
RU	04110002 05 02	Headwaters Tinkers Creek	3	5
RU	04110003 02 01	Indian Creek-Frontal Lake Erie	3	5
RU	04110003 02 02	Wheeler Creek-Frontal Lake Erie	3	5
RU	04110003 02 03	Arcola Creek	3i	5
RU	04110003 02 04	McKinley Creek-Frontal Lake Erie	3	5
RU	04110003 05 01	Marsh Creek-Frontal Lake Erie	3	5
RU	04110003 05 03	Euclid Creek	3	5
RU	04110003 05 04	Doan Brook-Frontal Lake Erie	3	5
RU	04120101 06 05	Marsh Run-Conneaut Creek	1h	5
RU	04120101 06 06	Town of North Kingsville-Frontal Lake Erie	3	5
RU	05030101 05 02	Headwaters West Fork Little Beaver Creek	3	5
RU	05030101 05 04	Patterson Creek-West Fork Little Beaver Creek	3	5
RU	05030101 06 05	Headwaters Bull Creek	3	5
RU	05030101 08 02	Headwaters North Fork Yellow Creek	3	5
RU	05030103 05 01	Upper Mosquito Creek	3	5
RU	05030103 05 02	Middle Mosquito Creek	3	5
RU	05030103 06 01	Duck Creek	3	5

Use	AU Number	AU Name	2014 Category	2016 Category
RU	05030103 06 02	Mud Creek	3	5
RU	05030103 07 05	Little Squaw Creek-Mahoning River	1	5
RU	05030103 08 02	Indian Run	3	5
RU	05030103 08 03	Andersons Run-Mill Creek	3	5
RU	05030103 08 04	Crab Creek	3	5
RU	05030103 08 07	Dry Run-Mahoning River	3	5
RU	05030103 08 09	Coffee Run-Mahoning River	3	5
RU	05030106 09 01	North Fork Captina Creek	1	5
RU	05030106 09 02	South Fork Captina Creek	1	5
RU	05030106 09 03	Bend Fork	1	5
RU	05030106 09 04	Piney Creek-Captina Creek	1	5
RU	05030201 01 03	Middle Sunfish Creek	1	5
RU	05030201 06 01	Rich Fork	3	5
RU	05030201 06 02	Cranenest Fork	3	5
RU	05030201 06 03	Wolfpen Run-Little Muskingum River	3	5
RU	05030201 06 04	Witten Fork	3	5
RU	05030201 06 05	Straight Fork-Little Muskingum River	3	5
RU	05030201 07 02	Archers Fork	3	5
RU	05030201 07 03	Wingett Run-Little Muskingum River	3	5
RU	05030201 07 04	Fifteen Mile Creek	3	5
RU	05030201 07 05	Eightmile Creek-Little Muskingum River	3i	5
RU	05030201 09 01	Headwaters West Fork Duck Creek	3	5
RU	05030201 10 06	Mill Creek-Ohio River	1	5
RU	05030202 01 02	Mile Run-Ohio River	3	5
RU	05030202 01 03	Headwaters Little Hocking River	3	5
RU	05030202 01 04	West Branch Little Hocking River	3	5
RU	05030202 01 05	Little West Branch Little Hocking River-Little Hocking River	3	5
RU	05030202 01 06	Sandy Creek-Ohio River	3	5
RU	05030202 02 01	Headwaters West Branch Shade River	3	5
RU	05030202 02 02	Kingsbury Creek	3	5
RU	05030202 02 03	Headwaters Middle Branch Shade River	3	5
RU	05030202 02 04	Elk Run-Middle Branch Shade River	3	5
RU	05030202 02 05	Walker Run-West Branch Shade River	3	5
RU	05030202 03 01	Horse Cave Creek	3	5
RU	05030202 03 02	Headwaters East Branch Shade River	3	5
RU	05030202 03 03	Big Run-East Branch Shade River	3	5
RU	05030202 08 02	Groundhog Creek-Ohio River	3	5
RU	05030202 08 04	West Creek-Ohio River	3	5
RU	05030202 09 01	Kyger Creek	1	5
RU	05030202 09 02	Campaign Creek	3	5
RU	05030204 01 02	Headwaters Rush Creek	1t	5
RU	05030204 10 01	Willow Creek-Hocking River	3	5
RU	05040001 02 03	Little Chippewa Creek	1t	5
RU	05040001 07 04	Headwaters Middle Conotton Creek	3	5
RU	05040001 13 03	Boggs Fork	1	5
RU	05040002 02 04	Outlet Rocky Fork	1	5

Use	AU Number	AU Name	2014 Category	2016 Category
RU	05040002 04 01	Honey Creek-Clear Fork Mohican River	1	5
RU	05040004 07 04	Fourmile Run-Meigs Creek	3	5
RU	05040004 08 07	Bald Eagle Run	3	5
RU	05040004 08 08	Bell Creek-Muskingum River	3	5
RU	05040004 08 09	Olney Run-Muskingum River	3	5
RU	05040004 09 01	South West Branch Wolf Creek	3	5
RU	05040004 09 02	Headwaters South Branch Wolf Creek	3	5
RU	05040004 09 03	Plumb Run-South Branch Wolf Creek	1h	5
RU	05040004 10 01	Headwaters West Branch Wolf Creek	3	5
RU	05040004 10 02	Aldridge Run-West Branch Wolf Creek	3	5
RU	05040004 10 03	Coal Run	3	5
RU	05040004 10 04	Hayward Run-Wolf Creek	1h	5
RU	05040004 11 01	Headwaters Olive Green Creek	3	5
RU	05040004 11 02	Keith Fork	3	5
RU	05040004 11 03	Little Olive Green Creek	3	5
RU	05040004 11 04	Reasoners Run-Olive Green Creek	3	5
RU	05040005 01 01	Headwaters Seneca Fork	3	5
RU	05040005 01 02	Beaver Creek	3	5
RU	05040005 01 03	Glady Run-Seneca Fork	3	5
RU	05040005 01 05	Opossum Run-Seneca Fork	3	5
RU	05040005 02 01	Yoker Creek	3	5
RU	05040005 02 02	Headwaters Collins Fork	3	5
RU	05040005 02 03	South Fork Buffalo Creek-Buffalo Creek	3	5
RU	05040005 02 04	North Fork Buffalo Creek-Buffalo Creek	3	5
RU	05040005 02 05	Crane Run-Buffalo Fork	3	5
RU	05040005 02 06	Chapman Run	3	5
RU	05040005 02 07	Trail Run-Wills Creek	3	5
RU	05040005 03 01	Headwaters Leatherwood Creek	3	5
RU	05040005 03 02	Hawkins Run-Leatherwood Creek	3	5
RU	05040005 04 01	Brushy Fork	3	5
RU	05040005 04 02	Headwaters Salt Fork	3	5
RU	05040005 04 03	Clear Fork	3	5
RU	05040005 04 04	Rocky Fork	3	5
RU	05040005 04 05	Salt Fork Lake-Sugartree Fork	3	5
RU	05040005 05 01	North Crooked Creek	3	5
RU	05040005 05 02	Headwaters Crooked Creek	3	5
RU	05040005 05 03	Peters Creek-Crooked Creek	3	5
RU	05040005 05 05	Indian Camp Run	3	5
RU	05040005 05 06	Headwaters Birds Run	3	5
RU	05040005 05 07	Johnson Fork-Birds Run	3	5
RU	05040005 06 01	Bacon Run	3	5
RU	05040005 06 02	Twomile Run-Wills Creek	3	5
RU	05040005 06 03	White Eyes Creek	3	5
RU	05040006 02 03	Dog Hollow Run-North Fork Licking River	1	5
RU	05060001 07 01	Headwaters Bokes Creek	3	5
RU	05060001 07 04	Moors Run-Scioto River	3	5

Use	AU Number	AU Name	2014 Category	2016 Category
RU	05060001 21 01	Worthington Ditch-Big Darby Creek	3	5
RU	05060001 22 01	Hellbranch Run	3i	5
RU	05060001 22 02	Gay Run-Big Darby Creek	3	5
RU	05060001 22 03	Greenbrier Creek-Big Darby Creek	1	5
RU	05080001 04 06	Turkeyfoot Creek-Great Miami River	1	5
RU	05080001 09 01	South Fork Stillwater River	3	5
RU	05080001 09 03	North Fork Stillwater River	3	5
RU	05080001 09 04	Boyd Creek	3	5
RU	05080001 09 05	Woodington Run-Stillwater River	3	5
RU	05080001 09 06	Town of Beamsville-Stillwater River	3	5
RU	05080001 10 01	Dismal Creek	3i	5
RU	05080001 10 02	Kraut Creek	3	5
RU	05080001 10 03	West Branch Greenville Creek	3	5
RU	05080001 10 04	Headwaters Greenville Creek	3	5
RU	05080001 11 01	Mud Creek	3	5
RU	05080001 11 02	Bridge Creek-Greenville Creek	3	5
RU	05080001 11 03	Dividing Branch-Greenville Creek	3	5
RU	05080001 12 01	Indian Creek	3	5
RU	05080001 12 03	Trotters Creek	3	5
RU	05080001 12 04	Harris Creek	3	5
RU	05080001 12 05	Town of Covington-Stillwater River	3	5
RU	05080001 13 01	Little Painter Creek	3	5
RU	05080001 13 02	Painter Creek	3	5
RU	05080001 13 03	Canyon Run-Stillwater River	1	5
RU	05080001 14 01	Brush Creek	3	5
RU	05080001 14 02	Ludlow Creek	3	5
RU	05080001 14 03	Brush Creek	3	5
RU	05080001 14 04	Jones Run-Stillwater River	3	5
RU	05080001 14 05	Mill Creek-Stillwater River	3i	5
RU	05080001 15 04	Glady Creek-Mad River	1	5
RU	05080001 16 03	Nettle Creek	3	5
RU	05080001 18 05	Rock Run-Mad River	3	5
RU	05080002 05 03	Beasley Run-Sevenmile Creek	1	5
RU	05080002 06 05	Cotton Run-Four Mile Creek	1h	5
RU	05080003 07 02	Headwaters East Fork Whitewater River	3	5
RU	05080003 07 04	Rocky Fork-East Fork Whitewater River	3	5
RU	05080003 08 10	Jameson Creek-Whitewater River	3	5
RU	05090101 04 01	Headwaters Little Raccoon Creek	1h	5
RU	05090101 08 02	Black Fork	3	5
RU	05090201 11 04	Bullskin Creek	3	5
RU	05090201 12 04	Ferguson Run-Twelvemile Creek	3	5
RU	05090201 12 06	Tenmile Creek	3	5
RU	05090201 12 08	Ninemile Creek-Ohio River	3	5
RU	05090202 14 02	Polk Run-Little Miami River	3	5
RU	05090203 01 03	Sharon Creek-Mill Creek	3	5
RU	05090203 02 02	Dry Creek-Ohio River	3	5

Use	AU Number	AU Name	2014 Category	2016 Category
RU	05090203 02 03	Muddy Creek	3	5
RU	05040005 90 01	Wills Creek Mainstem (Salt Fork to mouth); excluding Wills Creek Lake	3	5
RU	05080001 90 02	Stillwater River Mainstem (Greenville Creek to mouth)	3i	5
RU	05080001 90 03	Mad River Mainstem (Donnels Creek to mouth)	3i	5

J6. Schedule for TMDL Work

Once waters are assessed and the impaired waters are prioritized, the next step is to determine a schedule to address the monitoring needs of all waters and restoration needs (including TMDLs) of the impaired ones. Various factors must be considered, including Ohio's ongoing TMDL work; the process identified to do TMDLs; the monitoring strategy; and the resources available for the work.

Over the past few years, TMDL projects transitioned from the old HUC 11-scale watersheds to the new, smaller HUC 12-scale watersheds. Through 2009, TMDLs were completed using the HUC 11-scale AUs. Projects submitted for approval after April 1, 2010, reflect the new HUC 12-size units. Tables in Section J4 and the TMDL status map in Section K reflect current information based on the HUC 12 units.

J6.1. Ohio TMDL Status

Ohio EPA is currently working on TMDLs in about 40 project areas and has approved TMDLs in about 50 project areas. After 2016, only one project area will remain to be assessed using our current survey approach (i.e., the Whitewater River area in southwest Ohio). Table J-13 summarizes Ohio TMDLs approved by U.S. EPA at the 11-digit HUC level. Table J-14 summarizes Ohio TMDLs approved by U.S. EPA at the 12-digit HUC level. It must be noted that the Ohio Supreme Court decision arguably invalidates the approved TMDLs established by Ohio EPA, as noted in Section C on page C-17 of this report. Ohio EPA is evaluating alternatives for addressing both past and future TMDLs.

J6.2. Long-Term Schedules for Monitoring and TMDLs

Ohio's rotating basin approach (see Section D) provides a foundation for scheduling monitoring and TMDL projects. The assessment methodology allows that, generally, aquatic life use monitoring data up to 10 years old may be considered in judging AUs, so it follows that each AU must be monitored at least once every 10 years to maintain coverage. However, resources to maintain this pace are no longer available; cycling through the entire basin rotation would take about 15 to 20 years at current resource levels.

In an effort to maintain the monitoring and TMDL schedule, Ohio EPA is committed to researching and pursuing additional resources, both in terms of funding and partnering opportunities. Ohio's credible data law (ORC 6111.52) requires level three credible data to establish a TMDL and to identify, list and delist waters of the state for purposes of §303(d).

A map illustrating the long-term monitoring schedule is included in Section K. Detailed information for each AU is also available on the IR web site (http://epa.ohio.gov/dsw/tmdl/OhioIntegratedReport.aspx).

J6.3 Short-Term Schedule for TMDL Development

Ohio EPA has only scheduled a few TMDL projects during the next two years, as indicated in Table J-15. Because Ohio's TMDL process begins with a watershed assessment, all TMDLs to be completed in the next two years are already in progress. Since the process for finalizing TMDLs is uncertain following the Ohio Supreme Court decision (see Section C, page C-17), Ohio EPA does not anticipate submitting very many TMDLs to U.S. EPA for approval in the short term. However, the agency is still committed to restoring water quality and will be exploring other alternatives to this end in both the short and long term, as outlined in the 303(d) Vision discussion in Section C8 of this report.

Table J-13. Ohio TMDLs[13] approved by U.S. EPA at the 11-digit hydrologic unit scale[14].

AU Code	AU Name	U.S. EPA Approval Date	Pollutants Allocated, per U.S. EPA[15]
04110002 020	Cuyahoga River (below Black Brook to below Breakneck Creek)	10/11/2000	dissolved oxygen
04110002 030	Cuyahoga River (below Breakneck Creek to below Little Cuyahoga River)		
04110001 070	Rocky River (below West Br. to Lake Erie [including East Br.] and Lake Erie tribs [above Porter Cr to above Cuyahoga R]): Plum Creek	12/04/2001	phosphorus, nitrogen
05090202 010	Little Miami River (headwaters to above Massies Creek)	07/02/2002 05/13/2003	phosphorus, sediment
05090202 020	Little Miami River (above Massies Creek to below Beaver Creek)		
05090202 030	Little Miami River (below Beaver Creek of above Caesar Creek)		
05090202 040	Anderson Fork Caesar Creek		
05090202 050	Caesar Creek (except Anderson Fork)		
05060001 060	Bokes Creek (Scioto River above Bokes Creek to above Mill Creek)	09/27/2002 07/31/2003	phosphorus, sediment

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[13] One or more AUs may be included in a TMDL report; the determination is made on a project-by-project basis, at the discretion of Ohio EPA.

[14] While Ohio has completed these TMDLs and they were approved by U.S. EPA, in March 2015 in *Fairfield Cty. Bd. of Commrs. v. Nally,* 143 Ohio St. 3d 93, 2015-Ohio-991, the Ohio Supreme Court determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act." See Section C (page C-17) for more details.

[15] The TMDL goal is restoration of the designated use through the attainment of applicable criteria. Pollutants listed here were specifically recognized in U.S. EPA decision documents. TMDL reports typically include such parameters for targeting, pollutant load characterization and measuring interim progress and may explore other indicators of watershed condition.

AU Code	AU Name	U.S. EPA Approval Date	Pollutants Allocated, per U.S. EPA[15]
05040001 100	Sugar Creek (headwaters to above Middle Fork Sugar Creek)	11/20/2002 07/08/2003	phosphorus, nitrogen, sediment
05040001 110	South Fork Sugar Creek		
05040001 120	Sugar Creek (upstream Middle Fork to mouth)		
05090101 020	Raccoon Creek (headwaters to above Hewett Fork)	3/20/2003	pH (acid), metals
05090101 030	Raccoon Creek (above Hewett Fork to below Elk Fork)		
05060001 070	Mill Creek (Scioto River basin)	9/02/2003	CBOD, ammonia, phosphorus, sediment, aldrin, d-BHC, dieldrin, endosulfan, endrin, heptachlor
05030201 110	East Fork Duck Creek	9/23/2003	TSS, aluminum, iron, manganese, BOD, ammonia
05030201 120	Duck Creek (except East Fork)		
04110002 040	Cuyahoga River (below Little Cuyahoga River to below Brandywine Creek)	9/26/2003	fecal coliform, phosphorus
04110002 050	Cuyahoga River (below Brandywine Creek to below Tinkers Creek)		
04110002 060	Cuyahoga River (below Tinkers Creek to Lake Erie)		
04110002	Cuyahoga River (mainstem)		
05080001 090	Stillwater River (headwaters to above Swamp Creek)	06/15/2004	nitrates, phosphorus
05080001 100	Stillwater River (above Swamp Creek to above Greenville Creek)		
05080001 110	Greenville Creek (headwaters to below West Branch)		
05080001 120	Greenville Creek (below West Branch to Stillwater River)		
05080001 130	Stillwater River (below Greenville Creek to above Ludlow Creek)		
05080001 140	Stillwater River (above Ludlow Creek to Great Miami River)		
05080001	Stillwater River (mainstem)		
04100007 010	Auglaize River (headwaters to below Pusheta Creek)	09/23/2004	ammonia, phosphorus, pathogens, sediment
04100007 020	Auglaize River (below Pusheta Creek to above Jennings Creek)		
04100007 060	Auglaize River (above Jennings Creek to above Little Auglaize River)		

AU Code	AU Name	U.S. EPA Approval Date	Pollutants Allocated, per U.S. EPA[15]
04110002 010	Cuyahoga River (headwaters to below Black Brook)	09/27/2004	phosphorus, sediment
04100011 020	Sandusky River (headwaters to above Broken Sword Creek)	09/30/2004	phosphorus, pathogens, sediment
04100011 030	Broken Sword Creek		
04100011 040	Sandusky River (below Broken Sword Creek to above Tymochtee Creek)		
04100011 050	Tymochtee Creek (headwaters to below Warpole Creek)		
04100011 060	Tymochtee Creek (downstream Warpole Creek to Sandusky River)		
04100011 070	Sandusky River (below Tymochtee Creek to above Honey Creek)		
04100011 080	Honey Creek		
05090203 010	Mill Creek	04/26/2005	phosphorus, nitrogen
04100012 040	Lake Erie Tributaries (below Huron River to above Vermilion River) [Old Woman and Chappel Creeks]	08/31/2005	nutrients, siltation, habitat alteration
05030204 060	Monday Creek	09/22/2005	pH, metals, sediment
05060001 130	Big Walnut Creek (headwaters to Hoover Dam)	09/26/2005	nutrients (phosphorus), pathogens, siltation, organic enrichment, flow, habitat alteration
05060001 140	Big Walnut Creek (below Hoover Dam to above Alum Creek)		
05060001 150	Alum Creek (headwaters to Alum Creek Dam)		
05060001 160	Big Walnut Creek (above Alum Creek [except above Alum Creek Dam] to Scioto River)		
04110003 010 (partial)	Lake Erie Tributaries (East of Cuyahoga River to West of Grand River; excluding Chagrin River) [Euclid Creek]	09/27/2005	nutrients (phosphorus), organic enrichment,
04100012 010	West Branch Huron River (headwaters to above Slate Run)	09/28/2005	nutrients (phosphorus), siltation, organic enrichment, flow, habitat alteration
04100012 020	West Branch Huron River (above Slate Run to above East Branch Huron River)		
04100012 030	Huron River (above East Branch to Lake Erie) and Lake Erie Tributaries (below Sawmill Creek to below Huron River)		
05030101 070	Middle Fork Little Beaver Creek	09/28/2005	nutrients (phosphorus), pathogens, siltation, organic enrichment, flow, habitat alteration, unionized ammonia
05030101 080	West Fork Little Beaver Creek		
05030101 090	Little Beaver Creek (downstream Middle and West Forks to mouth)		

AU Code	AU Name	U.S. EPA Approval Date	Pollutants Allocated, per U.S. EPA[15]
05030204 070	Sunday Creek	03/31/2006	sediment, bacteria, acidity
05060001 190	Big Darby Creek (headwaters to below Sugar Run)	03/31/2006 10/27/2009	phosphorus, bacteria, sediment
05060001 200	Big Darby Creek (below Sugar Run to above Little Darby Creek)		
05060001 210	Little Darby Creek		
05060001 220	Big Darby Creek (below Little Darby Creek to Scioto River)		
04100010 020	Toussaint Creek	09/22/2006	phosphorus
05040004 020	Wakatomika Creek (headwaters to downstream Brushy Fork)	09/28/2006	bacteria, manganese, iron, aluminum, total dissolved solids, alkalinity
05040004 030	Wakatomika Creek (downstream Brushy Fork to mouth)		
05040001 100	Sugar Creek (headwaters to above Middle Fork Sugar Creek)	05/08/2007	bacteria
05040001 110	South Fork Sugar Creek		
05040001 120	Sugar Creek (upstream Middle Fork to mouth)		
04110003 020	Chagrin River (headwaters to downstream Aurora Branch)	07/10/2007	nutrients (phosphorus and nitrate), bacteria, total suspended solids
04110003 030	Chagrin River (downstream Aurora Branch to mouth)		
05060001 090	Olentangy River (headwaters to downstream Flat Run)	09/19/2007	nutrients (phosphorus), bacteria, total suspended solids
05060001 100	Whetstone Creek		
05060001 110	Olentangy River (downstream Flat Run to downstream Delaware Run); excluding Whetstone Creek		
05060001 120	Olentangy River (downstream Delaware Run to mouth)		
05120101 020	Beaver Creek (Grand Lake St. Marys and tributaries)	09/28/2007	nutrients (phosphorus and nitrate), bacteria
05120101 030	Beaver Creek (downstream Grand Lake St. Marys Dam to mouth)		
05030202 090	Leading Creek	1/9/2008	total dissolved solids, total

AU Code	AU Name	U.S. EPA Approval Date	Pollutants Allocated, per U.S. EPA[15]
04110001 020	West Branch Black River (headwaters to Black River)	8/20/2008	phosphorus, nitrate, bacteria, total suspended solids
04110001 030	East Branch Black River (headwaters to below Coon Creek)		
04110001 040	East Branch Black River (below Coon Creek to Black River)		
04110001 050	Black River (below East Branch to Lake Erie) and Lake Erie tribs (below Black R. to above Porter Cr)		
05040001 050	Nimishillen Creek	9/25/2008 12/16/2009	sediment, bacteria, phosphorus
04100007 110	Powell Creek	6/18/2009	phosphorus, nitrate- nitrogen, total suspended solids, biological oxygen
04100008 010	Blanchard River (headwaters to downstream Potato Run)	7/2/2009	phosphorus, bacteria, sediment
04100008 020	Blanchard River (downstream Potato Run to upstream Eagle Creek)		
04100008 030	Blanchard River (upstream Eagle Creek to upstream Ottawa Creek)		
04100008 040	Blanchard River (upstream Ottawa Creek to upstream Riley Creek); excluding Blanchard R.		
04100008 050	Riley Creek		
04100008 060	Blanchard River (downstream Riley Creek to mouth); excluding Blanchard R. mainstem		
04100008	Blanchard River (mainstem)		
05060002 070	Salt Creek (headwaters to upstream Queer Creek)	8/12/2009	sediment (bedload), habitat
05060002 080	Middle Fork Salt Creek		
05060002 090	Salt Lick Creek (excluding Middle Fork)		
05060002 100	Salt Creek (upstream Queer Creek to mouth); excluding Little Salt Creek and Middle Fork Salt Creek		

AU Code	AU Name	U.S. EPA Approval Date	Pollutants Allocated, per U.S. EPA[15]
05040001 010	Tuscarawas River (headwaters to downstream Wolf Creek)	9/15/2009	fecal coliform, sediment, phosphorus
05040001 020	Chippewa Creek		
05040001 030	Tuscarawas River (downstream Wolf Creek to downstream Sippo Creek); excluding Chippewa Creek		
05040001 090	Tuscarawas River (downstream Sippo Creek to upstream Sugar Creek); excluding Tuscarawas R. mainstem		
05040001 130	Tuscarawas River (downstream Sugar Cr. to upstream Stillwater Cr.); excluding Tuscarawas R. mainstem		
05040001 180	Tuscarawas River (downstream Stillwater Cr. to upstream Evans Cr.); excluding Tuscarawas R. mainstem		
05040001 190	Tuscarawas River (upstream Evans Creek to mouth); excluding Tuscarawas R. mainstem		
05040001	Tuscarawas River (mainstem)		
05030204 010	Hocking River (headwaters to Enterprise); excluding Rush Creek and Clear Creek	9/25/2009	fecal coliform, total phosphorus, sediment (bedload)
05030204 020	Rush Creek (headwaters to upstream Little Rush Creek)		
05030204 030	Rush Creek (upstream Little Rush Creek to mouth)		
05030204 040	Clear Creek		
05030204 050	Hocking River (Enterprise to upstream Monday Creek); excluding Hocking R. mainstem dst. Duck Creek		
05030204 080	Hocking River (downstream Monday Creek to Athens/RM 33.1); excluding Hocking R. mainstem		
05030204 090	Federal Creek		
05030204 100	Hocking River (downstream Athens/RM 33.1 to mouth); excluding Federal Creek and Hocking R. mainstem		
05030204	Hocking River (mainstem)		

AU Code	AU Name	U.S. EPA Approval Date	Pollutants Allocated, per U.S. EPA[15]
04100009 070	Swan Creek (headwaters to above Blue Creek)	1/6/2010 10/25/2010	*E. coli*, total phosphorus, nitrate- nitrogen, total suspended solids, total aluminum, total copper, ammonia, total dissolved solids, dieldrin, strontium, benzo(a)pyrene
04100009 080	Swan Creek (above Blue Creek to Maumee River)		
05080001 150	Mad River (headwaters to below Kings Creek)	1/26/2010	fecal coliform, sediment (bedload), nitrate
05080001 160	Mad River (below Kings Creek to below Chapman Creek)		
05080001 170	Buck Creek		
05080001 180	Mad River (below Chapman Cr. to above Mud Cr. [except Buck Cr.])		
05080001 190	Mad River (above Mud Cr. to Great Miami River)		
05080002 030	Twin Creek (headwaters to above Bantas Fork)	3/4/2010	fecal coliform, sediment
05080002 040	Twin Creek (above Bantas Fork to Great Miami River)		
05030101 100	Ohio River (downstream Little Beaver Cr to upstream Yellow Creek) (Little Yellow Cr)	3/18/2010	fecal coliform, total phosphorus
05030101 180	Yellow Creek (headwaters to upstream Town Fork)		
05030101 190	Yellow creek (upstream Town Fork to mouth)		
05060001 170	Walnut Creek (headwaters to below Sycamore Creek)	5/4/2010	fecal coliform, sediment
05060001 180	Walnut Creek (below Sycamore Creek to Scioto River)		

Table J-14. Ohio TMDLs[16] approved by U.S. EPA at the 12-digit hydrologic unit scale.[17]

AU Code	AU Name	U.S. EPA Approval Date	Pollutants Allocated, per U.S. EPA[18]
05080001 09 01 – 06	Headwaters Stillwater River	9/8/2009[19]	phosphorus
05080001 10 01 – 04	Headwaters Greenville Creek		
05080001 11 01 – 03	Mud Creek-Greenville Creek		
05080001 12 01 – 05	Swamp Creek-Stillwater River		
05080001 13 01 – 03	Painter Creek-Stillwater River		
05080001 14 01 – 06	Ludlow Creek-Stillwater River		
05080001 90 02	Stillwater River Mainstem (Greenville Creek to mouth)		
05090201 09 01 – 04	Headwaters White Oak Creek	2/25/2010	fecal coliform, ammonia, total phosphorus, habitat/ total suspended solids, dissolved oxygen, nitrate + nitrite, atrazine
05090201 10 01 – 03	Sterling Run-White Oak Creek		
05090202 06 01 – 06	Headwaters Todd Fork	3/28/2011	*E. coli*, total phosphorus, chemical oxygen demand, sediment, total suspended solids, carbonaceous biochemical oxygen demand
05090202 07 01 – 04	East Fork Todd Fork-Todd Fork		
05090202 08 01 – 04	Turtle Creek-Little Miami River		
05090202 09 01 – 03	O'Bannon Creek-Little Miami River		
05090202 14 01 – 06	Sycamore Creek-Little Miami River		
05090202 90 01	Little Miami River Mainstem (Caesar Creek to O'Bannon Creek)		
05090202 90 02	Little Miami River Mainstem (O'Bannon Creek to Ohio River)		
05040004 06 01 – 06	Salt Creek (Muskingum River watershed)	6/6/2011	*E. coli*

[16] One or more AUs may be included in a TMDL report. The determination is made on a project-by- project basis, at the discretion of Ohio EPA.
[17] While Ohio has completed these TMDLs and they were approved by U.S. EPA, in March 2015 in *Fairfield Cty. Bd. of Commrs. v. Nally,* 143 Ohio St. 3d 93, 2015-Ohio-991, the Ohio Supreme Court determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act." See Section C (page C-17) for more details.
[18] The TMDL goal is restoration of the designated use through the attainment of applicable criteria; pollutants listed here were specifically recognized in U.S. EPA decision documents. TMDL reports typically include such parameters for targeting, pollutant load characterization and measuring interim progress and may explore other indicators of watershed condition.
[19] The TMDL was revised for one pollutant.

AU Code	AU Name	U.S. EPA Approval Date	Pollutants Allocated, per U.S. EPA[18]
05030103 01 01 – 03	Headwaters Mahoning River	9/28/2011 10/19/2011	*E. coli*, sediment, phosphorus
05030101 02 01 – 04	Deer Creek-Mahoning River		
05030101 03 01 – 06	West Branch Mahoning River-Mahoning River		
05030101 04 01 – 06	Eagle Creek-Mahoning River		
04100010 01 01 – 04	Rocky Ford-Middle Branch Portage River	9/30/2011	*E. coli*, total phosphorus, carbonaceous biochemical oxygen demand, sediment
04100010 02 01 – 05	South Branch Portage River-Middle Branch Portage River		
04100010 03 01 – 02	Upper Portage River		
04100010 04 01 – 02	Middle Portage River		
04100010 05 01 – 02	Lower Portage River-Frontal Lake Erie		
05060002 14 01 – 06	South Fork Scioto Brush Creek	9/30/2011	*E. coli*, phosphorus
05060002 15 01 – 07	Scioto Brush Creek		
05080001 01 01 – 03	Headwaters Great Miami River	3/26/2012	*E. coli*, sediment, nutrients, total dissolved solids
05080001 02 01 – 04	Muchinippi Creek		
05080001 03 01 – 06	Bokengehalas Creek-Great Miami River		
05080001 04 01 – 06	Stoney Creek-Great Miami River		
05080001 05 01 – 03	Headwaters Loramie Creek		
05080001 06 01 – 04	Turtle Creek-Loramie Creek		
04110004 04 01 – 03	Griggs Creek-Mill Creek	4/12/2012	*E. coli*, phosphorus, flow regime
04110004 06 01 – 07	Big Creek-Grand River		
05060003 01 01 – 03	Headwaters Paint Creek	9/18/2012	*E. coli*, sediment
05060003 02 01 – 02	Sugar Creek		
05060003 03 01 – 05	Headwaters Rattlesnake Creek		
05060003 04 01 – 07	Lees Creek-Rattlesnake Creek		
05060003 05 01 – 05	Rocky Fork		
05060003 06 01 – 03	Indian Creek-Paint Creek		
05060003 07 01 – 04	Buckskin Creek-Paint Creek		
05060003 08 01 – 05	Headwaters North Fork Paint Creek		
05060003 09 01 – 04	Little Creek-North Fork Paint Creek		
05060003 10 01 – 03	Ralston Run-Paint Creek		
05060003 90 01	Paint Creek Mainstem (Paint Creek Lake dam to mouth)		

AU Code	AU Name	U.S. EPA Approval Date	Pollutants Allocated, per U.S. EPA[18]
04100010 07 01 – 06	Cedar Creek-Frontal Lake Erie	9/25/2012	total phosphorus, nitrate + nitrite, ammonia, total suspended solids, *E. coli*
04100009 09 01 – 04	Grassy Creek-Maumee River		
04110004 01 01 – 06	Headwaters Grand River	4/10/2013	*E. coli,* total phosphorus, total kjeldahl nitrogen, ammonia, total dissolved solids,
04110004 02 01 – 03	Rock Creek		
04110004 03 01 – 05	Phelps Creek-Grand River		
04110004 05 01 – 02	Three Brothers Creek-Grand River		
05040004 04 01 – 07	Jonathan Creek	7/10/2013	*E. coli*, acidity
05040004 05 01 – 04	Moxahala Creek		
04100007 03 01 – 06	Upper Ottawa River Mid	4/15/2014	*E. coli,* total phosphorus, sediment
04100007 04 01 – 06	Middle Ottawa River		
04100007 05 01 – 03	Lower Ottawa River		
04100011 01 01 – 03	Lower Sandusky	8/11/2014	*E. coli,* total phosphorus, total suspended solids, nitrate+nitrite
04100011 01 02 – 05	Pickeral Creek-Frontal Sandusky Bay		
04100011 10 01 – 04	Wolf Creek		
04100011 11 01 – 05	Rock Creek - Sandusky River		
04100011 90 01 – 02	Sandusky Mainsteam (Tymochtee Creek to Sandusky Bay)		
04100011 12 01 – 03	Green Creek		
04100011 13 01 – 03	Muskellunge Creek-Sandusky River		
04100011 14 01 – 05	Muddy Creek-Frontal Sandusky Bay		

Table J-15. Short-term schedule for TMDL development.

AU Code	AU Name
TMDLs approved by U.S. EPA after public review of 2014 303(d) list began	
None at this time	
TMDLs pending approval by U.S. EPA	
None at this time	
TMDLs expected to be submitted to U.S. EPA in FFY 2017	
05060001 01 01 – 04 05060001 02 01 – 03 05060001 03 01 – 04 05060001 04 01 – 06 05060001 05 01 – 05 05060001 06 01 – 04 05060001 90 01	Headwaters Scioto River Rush Creek Little Scioto River Panther Creek-Scioto River Fulton Creek-Scioto River Mill Creek Scioto River Mainstem (L. Scioto R. to Olentangy R.); excluding O'Shaughnessy and Griggs reservoirs
05040002 01 01 – 05 05040002 02 01 – 04 05040002 03 01 – 03 05040002 04 01 – 05 05040002 05 01 – 03 05040002 06 01 – 06 05040002 07 01 – 03 05040002 08 01 – 06 05040002 90 01	Headwaters Black Fork Mohican River Rocky Fork-Black Fork Mohican River Headwaters Clear Fork Mohican River Possum Run-Clear Fork Mohican River Muddy Fork Mohican River Jerome Fork-Mohican River Lake Fork Mohican River Mohican River Mohican River Mainstem (entire length)
TMDLs expected to be submitted to U.S. EPA in FFY 2018	
05040006 01 01 – 04 05040006 02 01 – 05 05040006 03 01 – 04 05040006 04 01 – 09 05040006 05 01 – 04 05040006 06 01 – 04	Headwaters North Fork Licking River Lake Fork Licking River-North Fork Licking River Raccoon Creek South Fork Licking River Rocky Fork-Licking River Big Run-Licking River
05040003 01 01 – 03 05040003 02 01 – 03 05040003 03 01 – 07 05040003 04 01 – 03	North Branch Kokosing River Headwaters Kokosing River Schenck Creek-Kokosing River Jelloway Creek-Kokosing River
05080001 07 01 – 05 05080001 08 01 – 05 05080001 20 01 – 05 05080001 90 01	Tawawa Creek-Great Miami River Lost Creek-Great Miami River Honey Creek-Great Miami River Great Miami River mainstem (Tawawa Creek to Mad River)
05090202 10 01 - 06 05090202 11 01 - 03 05090202 12 01 - 04 05090202 13 01 - 05	Headwaters East Fork Little Miami River Fivemile Creek-East Fork Little Miami River Cloverlick Creek-East Fork Little Miami River (*includes W.H. Harsha Lake*) Stonelick Creek-East Fork Little Miami River
04100001 03 01 - 09 04100002 03 01, 03, 04	Ottawa River-Frontal Lake Erie Little River Raisin-River Raisin

AU Code	AU Name
05080002 01 01 – 07 05080002 04 01 – 04 05080002 07 01 – 06 05080002 09 01 – 07 05080002 90 01 05080002 90 02	Wolf Creek-Great Miami River Bear Creek-Great Miami River Dicks Creek-Great Miami River Taylor Creek-Great Miami River Great Miami River Mainstem (Mad River to Four Mile Creek) Great Miami River Mainstem (Four Mile Creek to Ohio River)
TMDL projects that are being developed with assistance from U.S. EPA; completion expected by FFY 2017.	
04100005 90 01 04100009 90 01 04100009 90 02	Maumee River Mainstem (IN border to Tiffin River) Maumee River Mainstem (Tiffin River to Beaver Creek) Maumee River Mainstem (Beaver Creek to Maumee Bay)
04100003 01 04, 06 04100003 02 04 04100003 03 01-06 04100003 04 02, 05, 06 04100003 05 01-03,05,06	East Branch St Joseph River West Branch St Joseph River Nettle Creek-St Joseph River Fish Creek Sol Shank Ditch-St Joseph River
04110001 03 01 - 03 04110001 04 01 - 04 04110001 05 01 - 06 04110001 06 01 - 03	Headwaters East Branch Black River East Branch Black River West Branch Black River Black River
04100006 02 01-05 04100006 03 01-03 04100006 04 01-04 04100006 05 01-04 04100006 06 01-04	Mill Creek-Bean Creek Upper Tiffin River Lick Creek Middle Tiffin River Lower Tiffin River

Section

K

Maps

Ohio 8-Digit Hydrologic Units

Ohio 2016 Integrated Report

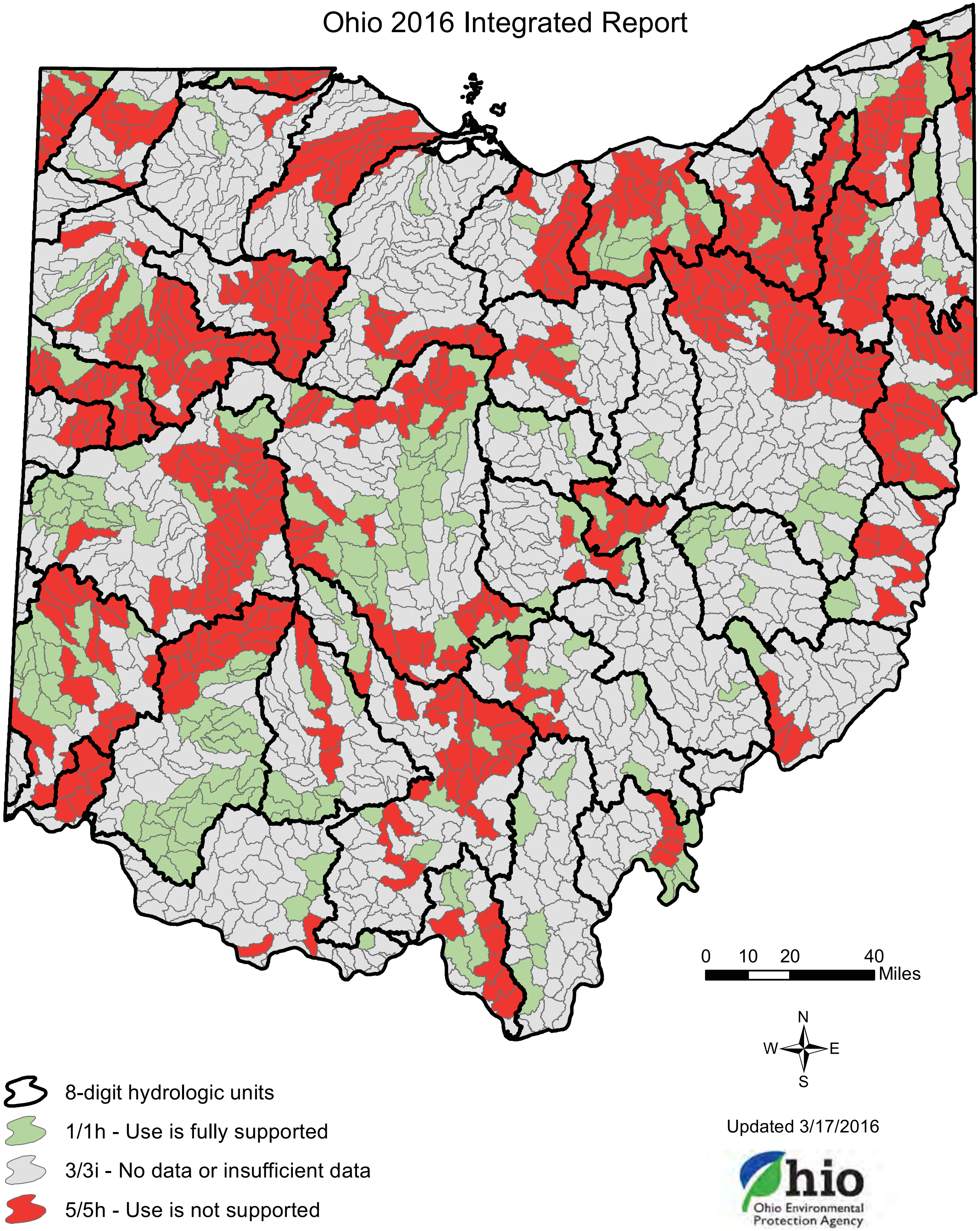
Updated 2/22/2016

This map is provided to help in interpreting the other maps.
It includes county boundaries and the names, numbers, and
boundaries of the major (8-digit hydrologic unit) watersheds.

Ohio Environmental Protection Agency

Section 303(d) Human Health (Fish Tissue) Use Categories
Watershed Assessment Units

Ohio 2016 Integrated Report

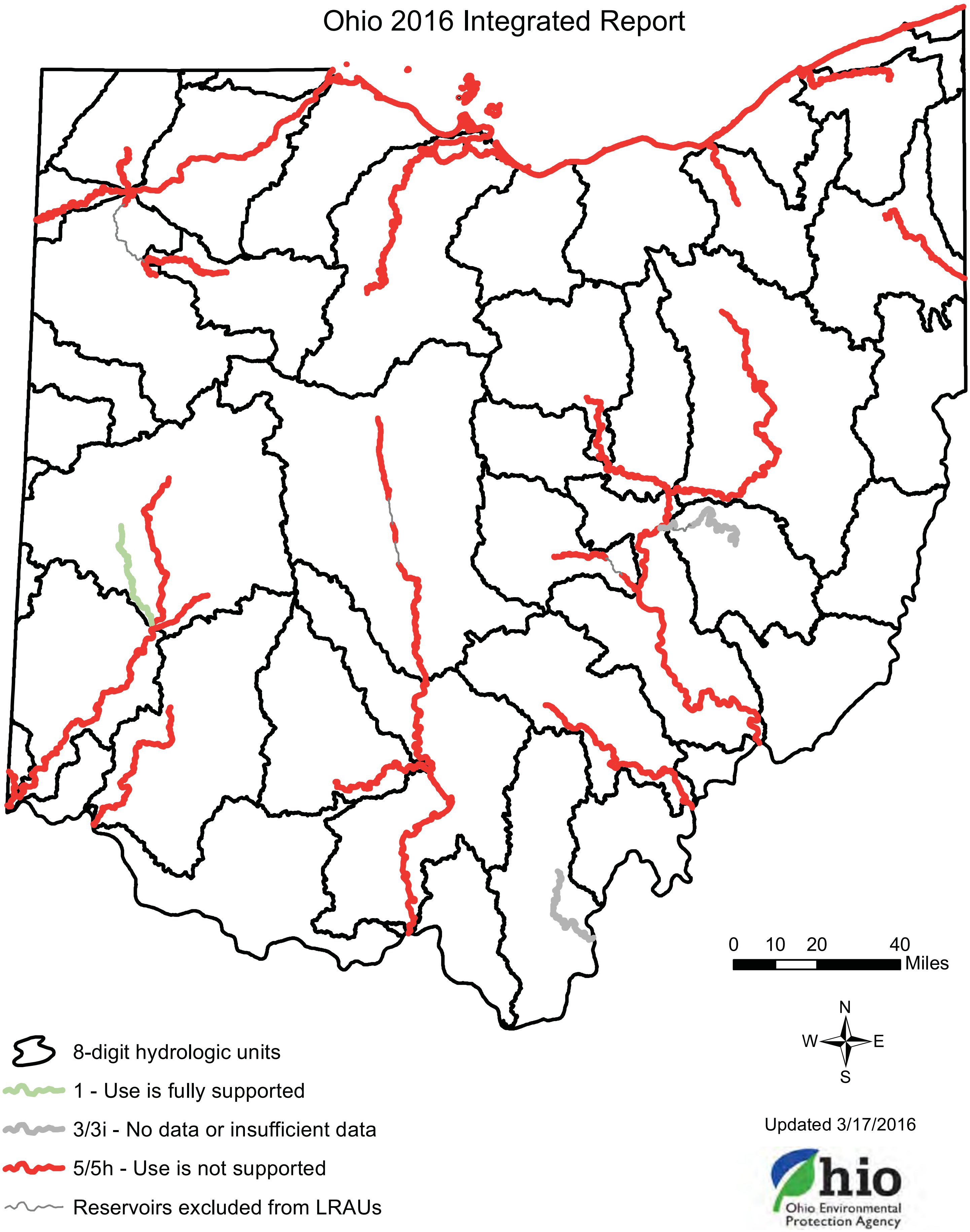


Updated 3/17/2016

Ohio Environmental Protection Agency

Section 303(d) Human Health (Fish Tissue) Use Categories Large River and Lake Erie Assessment Units

Ohio 2016 Integrated Report

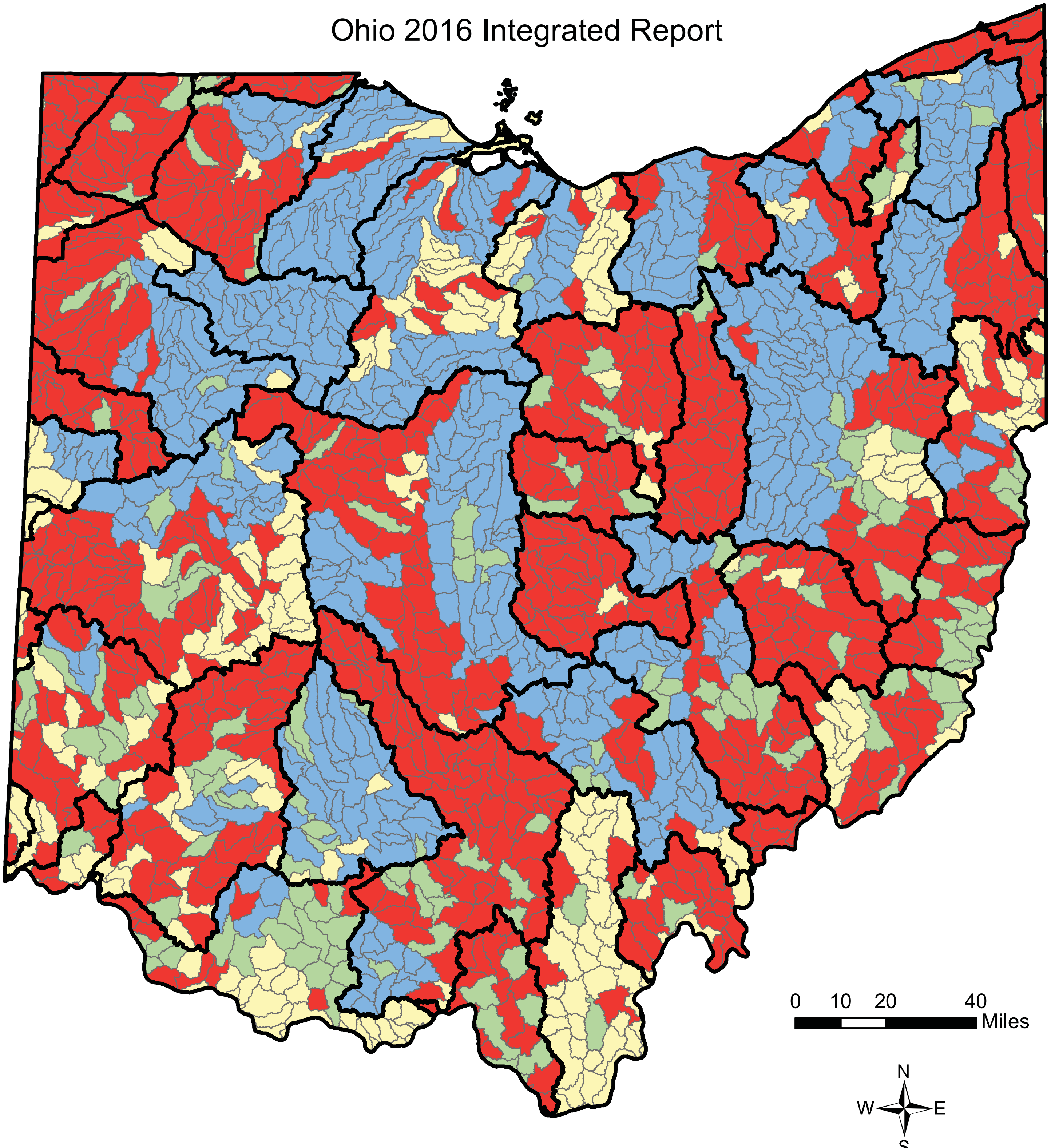


Updated 3/17/2016

Ohio Environmental Protection Agency

Section 303(d) Recreation Use Categories
Watershed Assessment Units

Ohio 2016 Integrated Report



8-digit hydrologic units

1/1d/1h/1t - Use is fully supported; TMDL approved (t)

3 - No data

4A/4Ah/4Ahx/4Ax - TMDL approved

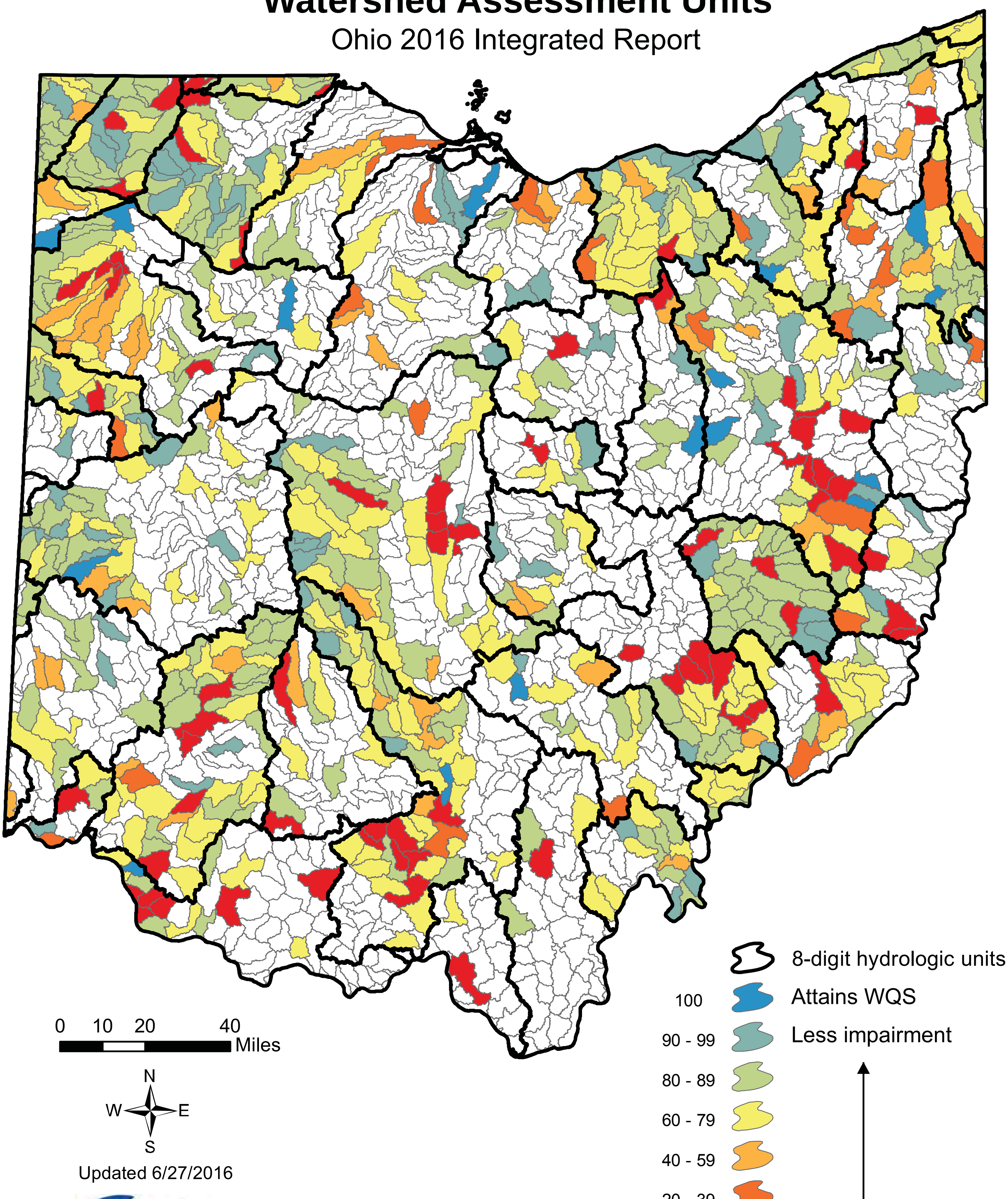
5/5h - Use is not supported

Updated 6/27/2016

Ohio Environmental Protection Agency

Recreation Use Index Scores
Watershed Assessment Units

Ohio 2016 Integrated Report

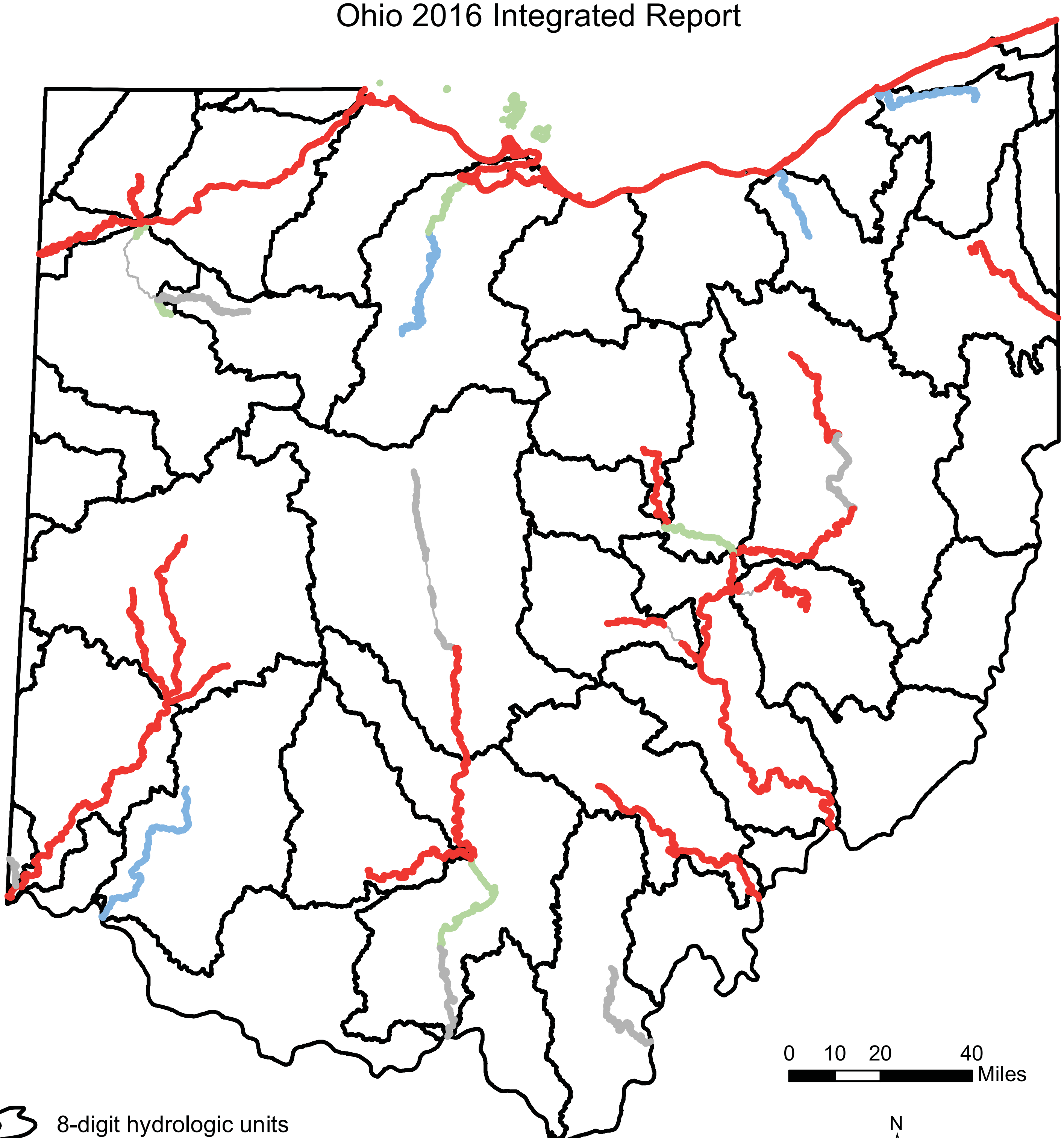


Updated 6/27/2016

Ohio Environmental Protection Agency

Section 303(d) Recreation Use Categories
Large River and Lake Erie Assessment Units

Ohio 2016 Integrated Report



8-digit hydrologic units

1/1d/1h - Use is fully supported; TMDL approved (d)

3/3i - No data or insufficient data

4A/4Ah - TMDL approved

5/5h - Use is not supported

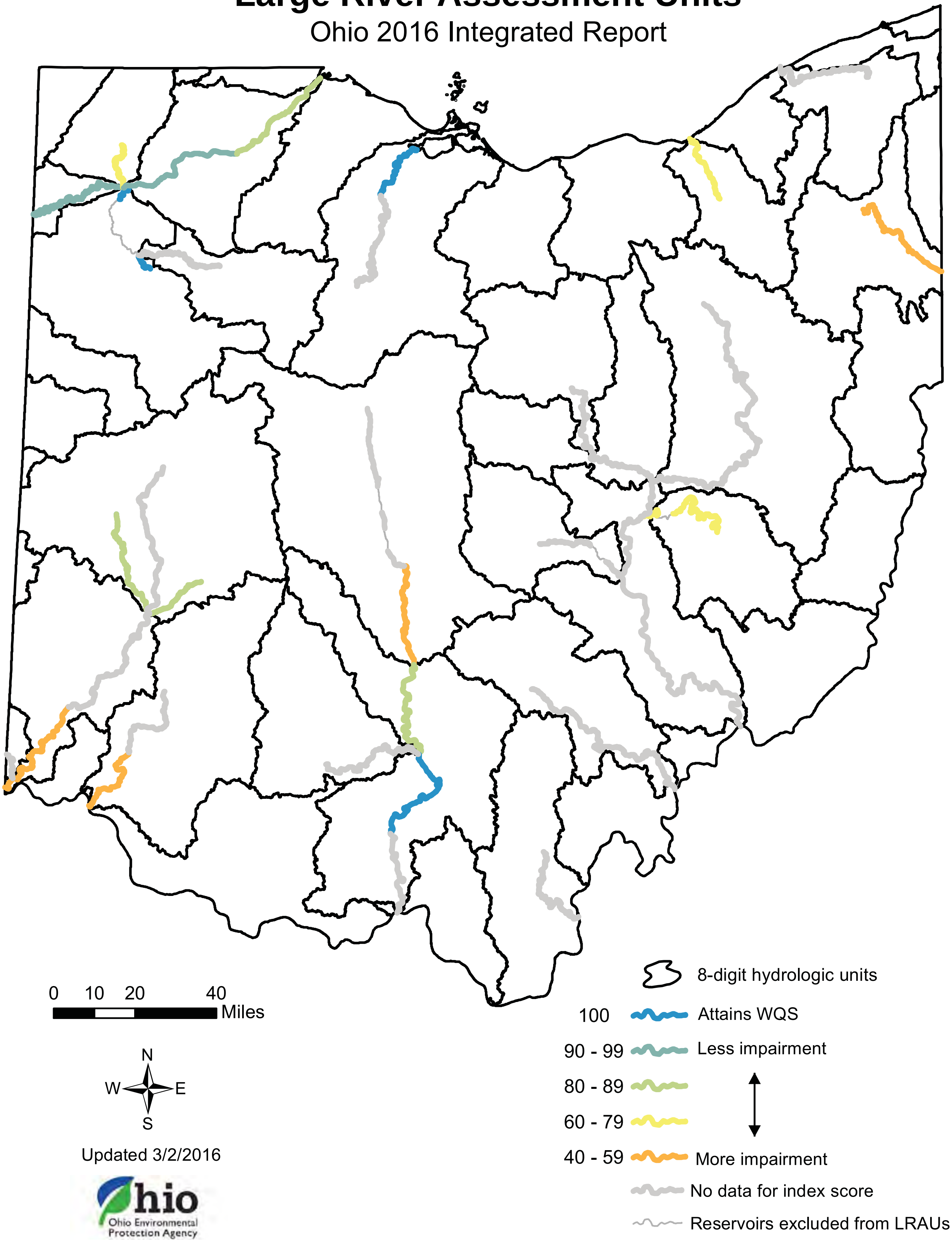
Reservoirs excluded from LRAUs

Updated 3/1/2016

Ohio Environmental Protection Agency

Recreation Use Index Scores
Large River Assessment Units

Ohio 2016 Integrated Report

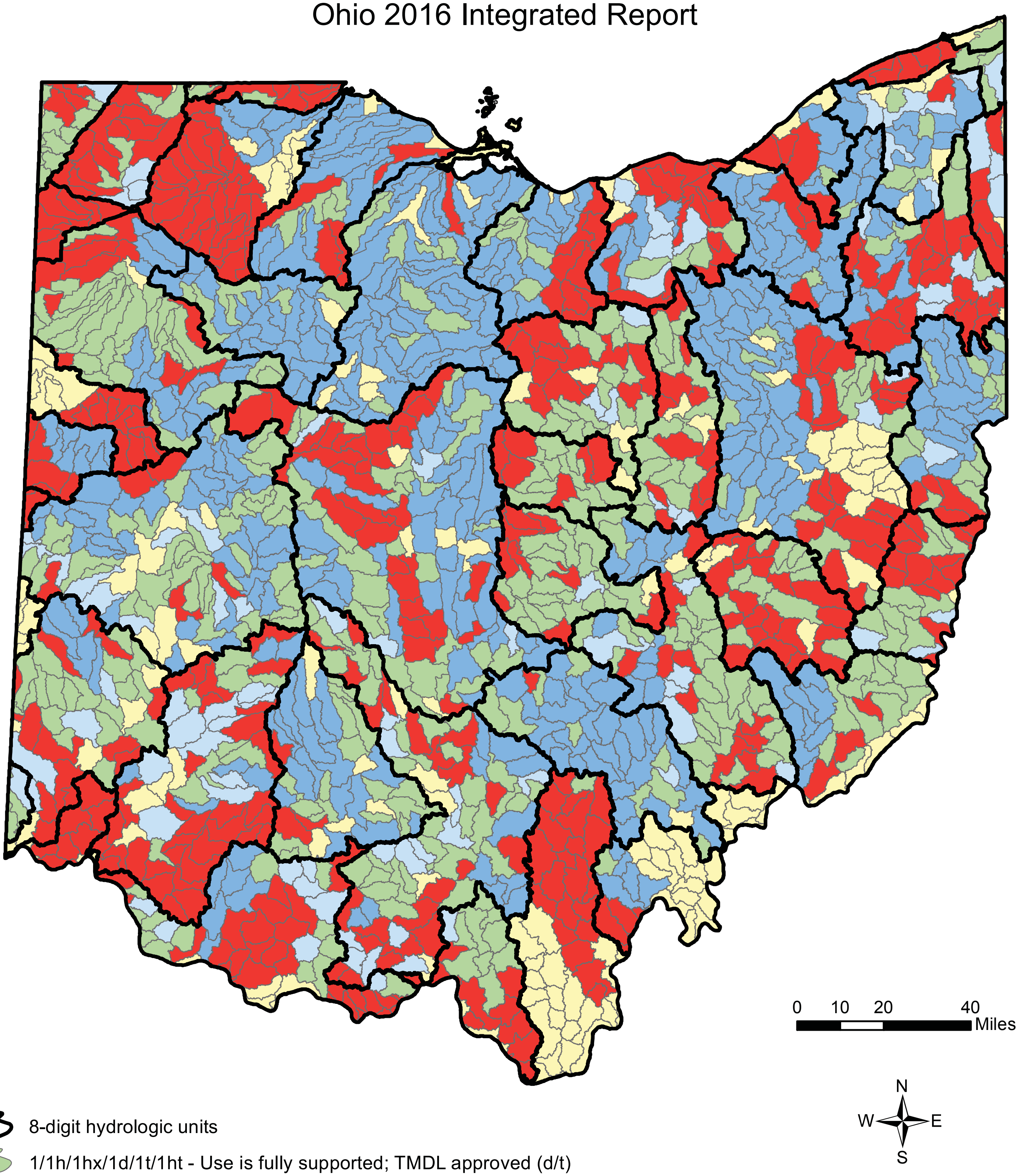


Updated 3/2/2016

Ohio Environmental Protection Agency

Section 303(d) Aquatic Life Use Categories
Watershed Assessment Units

Ohio 2016 Integrated Report



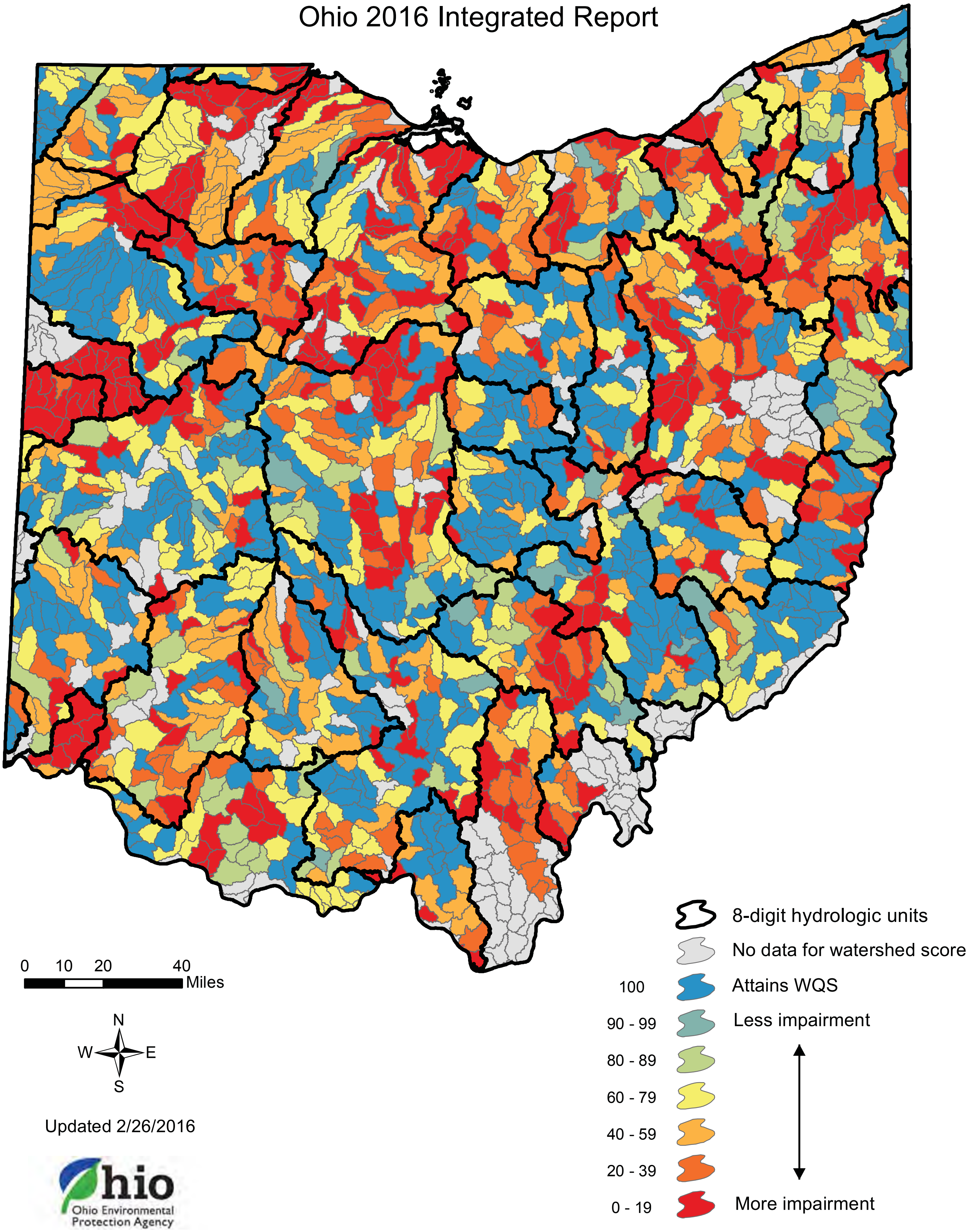
8-digit hydrologic units
1/1h/1hx/1d/1t/1ht - Use is fully supported; TMDL approved (d/t)
3/3i/3ih/3x/3t/3it/3iht - No data or insufficient data; TMDL approved (t)
4A/4Ah - TMDL approved
4C/4Ch/4n/4nh - Impairment not from a pollutant; natural causes (n)
5/5d/5h/5hx - Use is not supported; TMDL approved (d)

Updated 2/26/2016

Ohio Environmental Protection Agency

Aquatic Life Use Index Scores
Watershed Assessment Units

Ohio 2016 Integrated Report

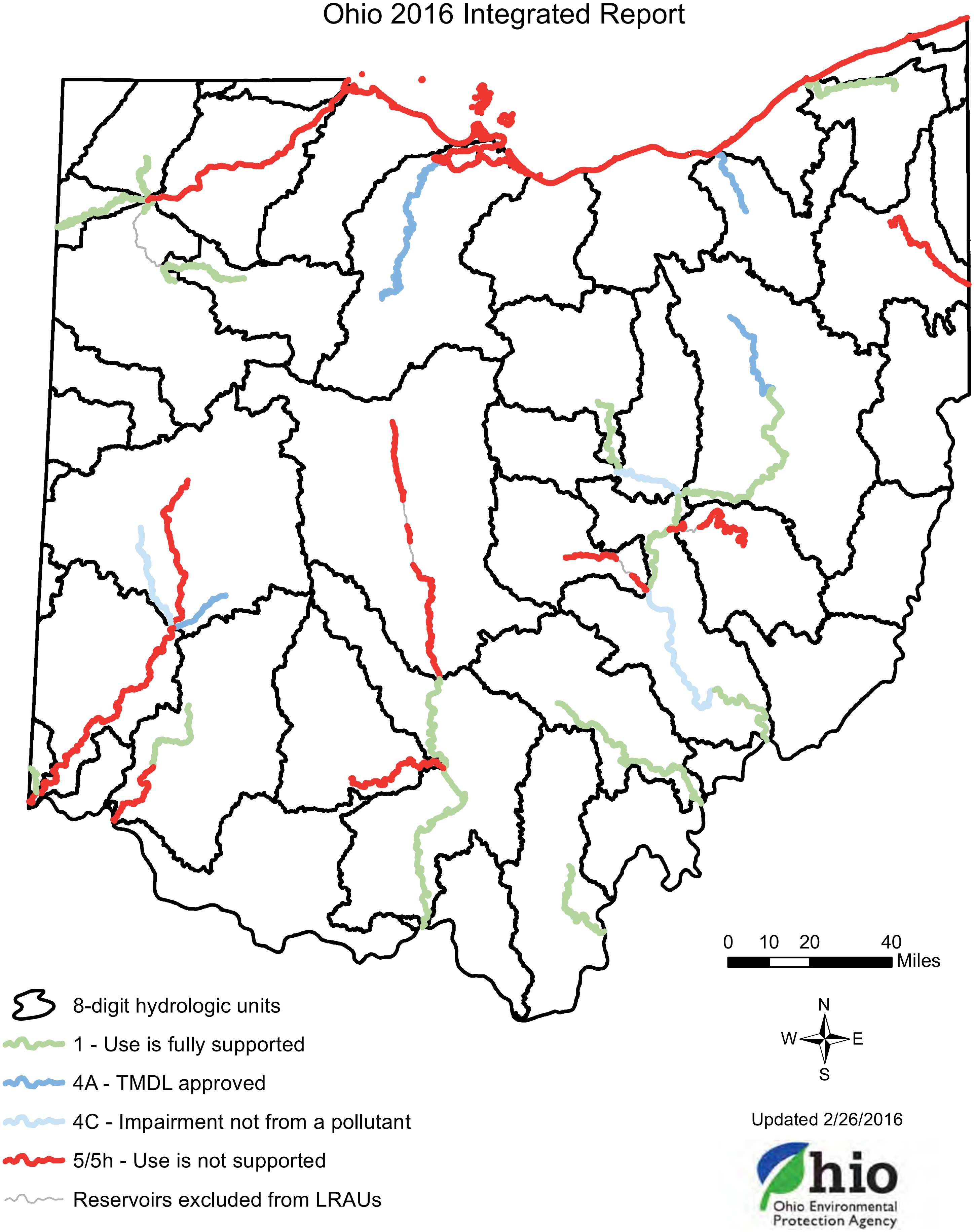


Updated 2/26/2016

Ohio Environmental Protection Agency

Section 303(d) Aquatic Life Use Categories
Large River and Lake Erie Assessment Units

Ohio 2016 Integrated Report

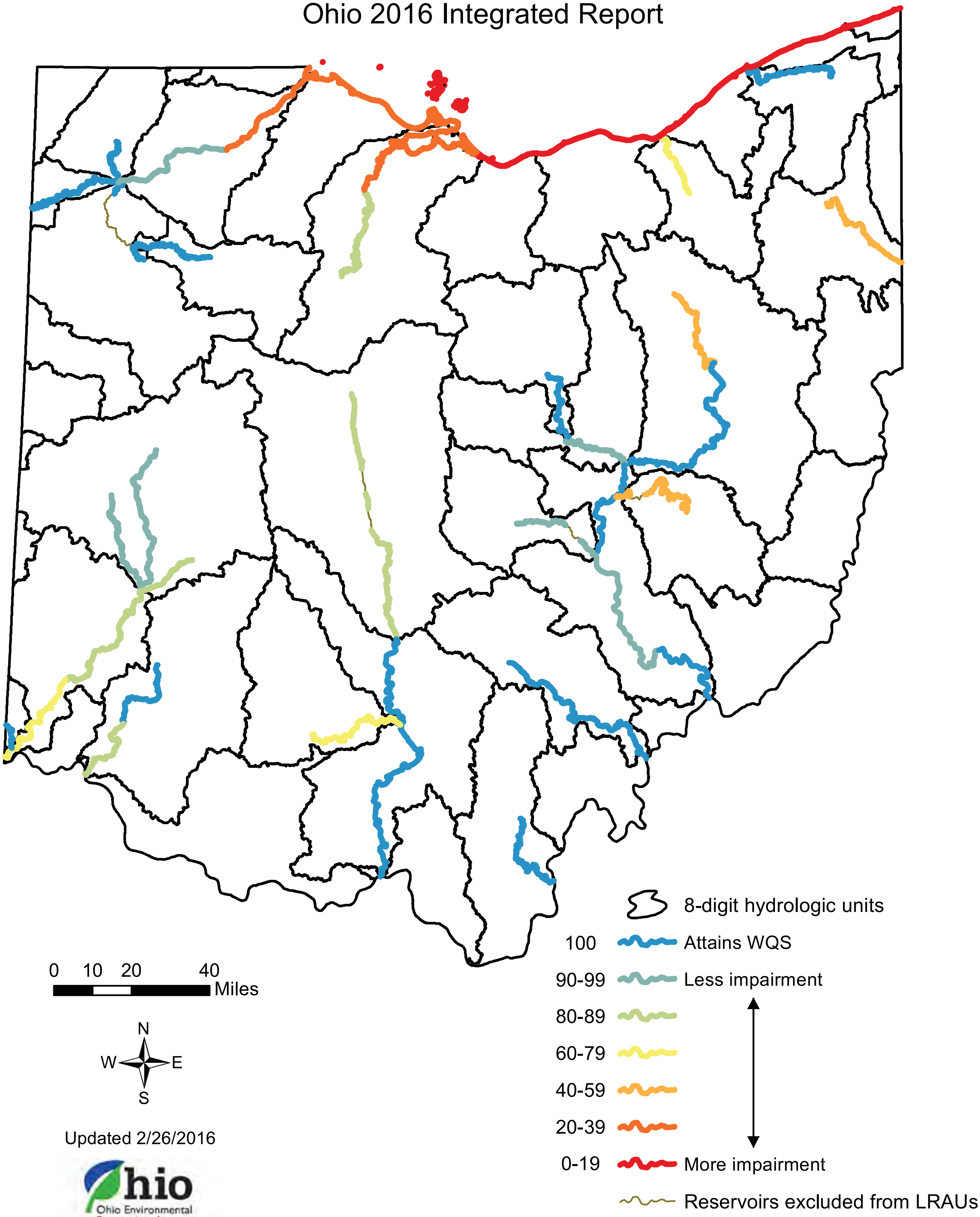


Updated 2/26/2016

Ohio Environmental Protection Agency

Aquatic Life Use Index Scores
Large River and Lake Erie Assessment Units

Ohio 2016 Integrated Report

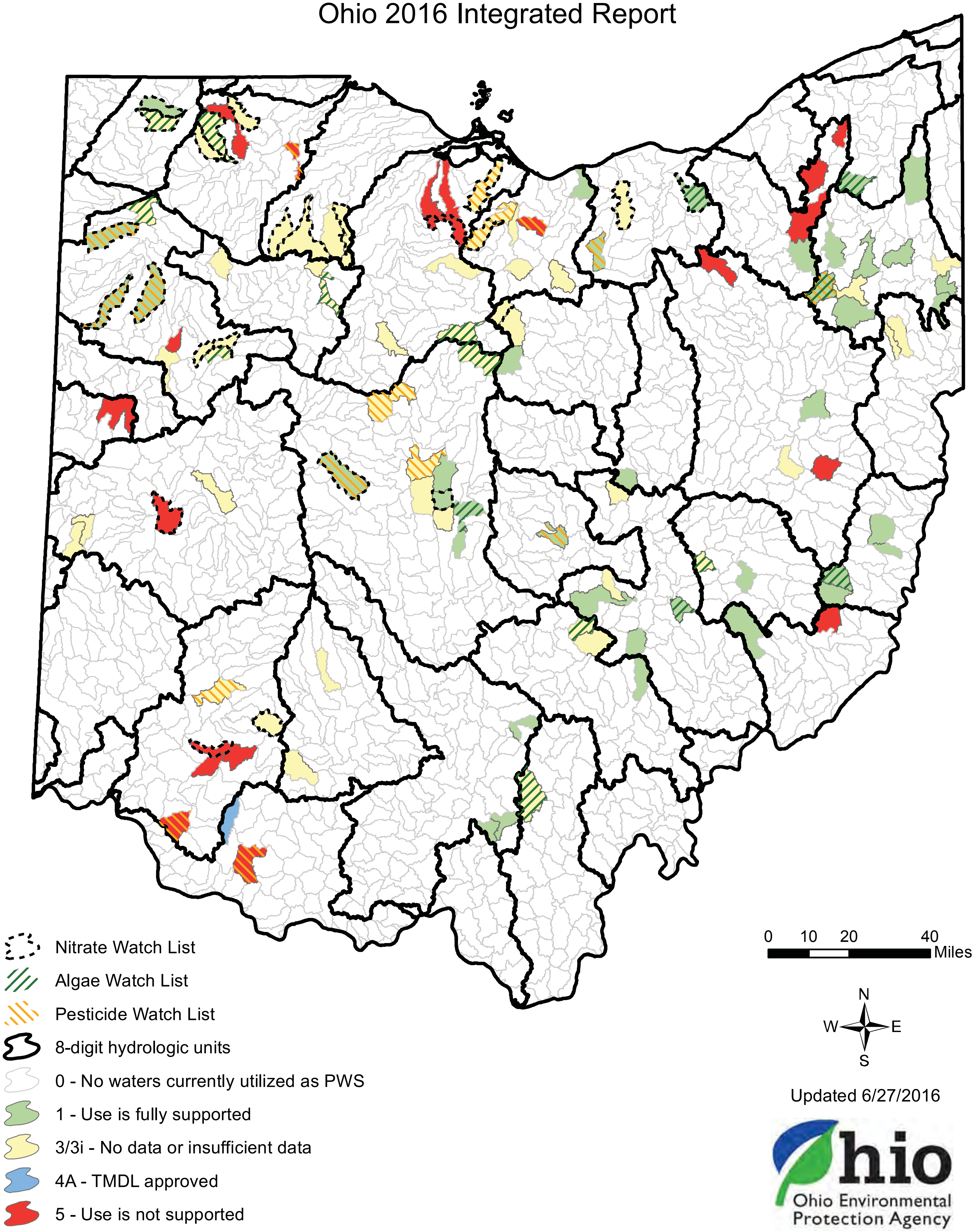


Updated 2/26/2016

Ohio Environmental Protection Agency

Section 303(d) Public Drinking Water Supply Use Categories
Watershed Assessment Units

Ohio 2016 Integrated Report

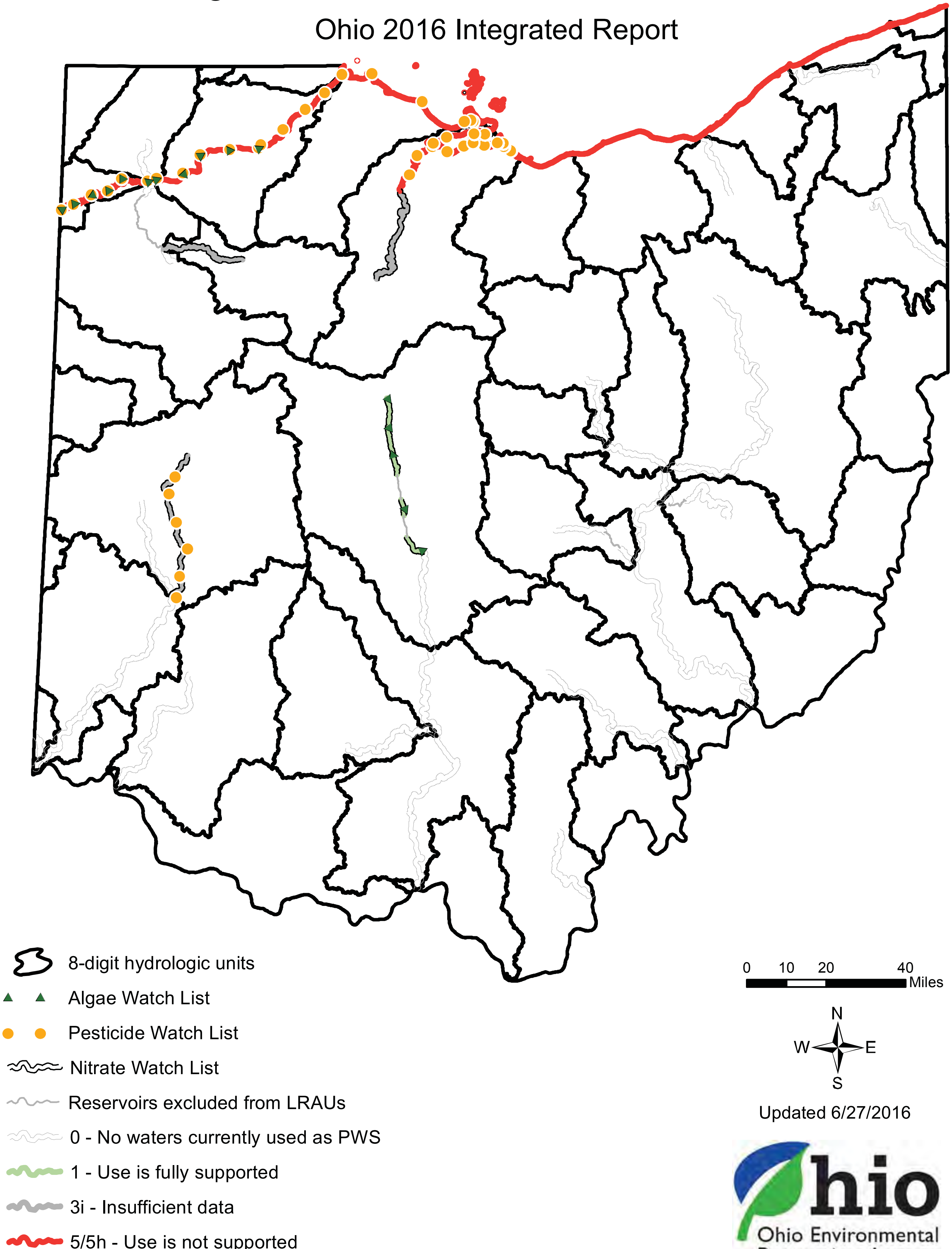


Updated 6/27/2016

Ohio Environmental Protection Agency

Section 303(d) Public Drinking Water Supply Use Categories
Large River and Lake Erie Assessment Units

Ohio 2016 Integrated Report

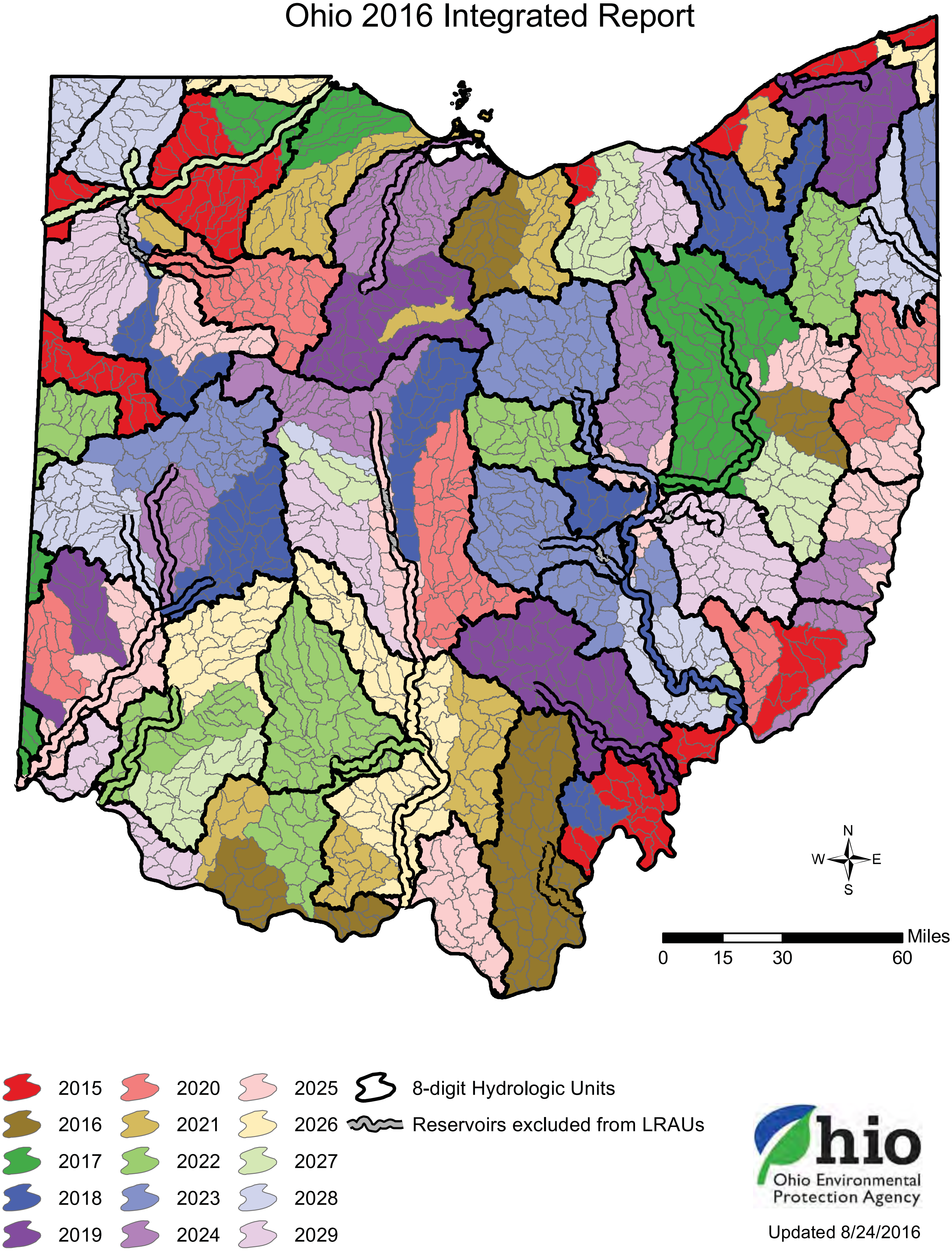


Updated 6/27/2016

Ohio Environmental Protection Agency

Long-Term Monitoring Schedule

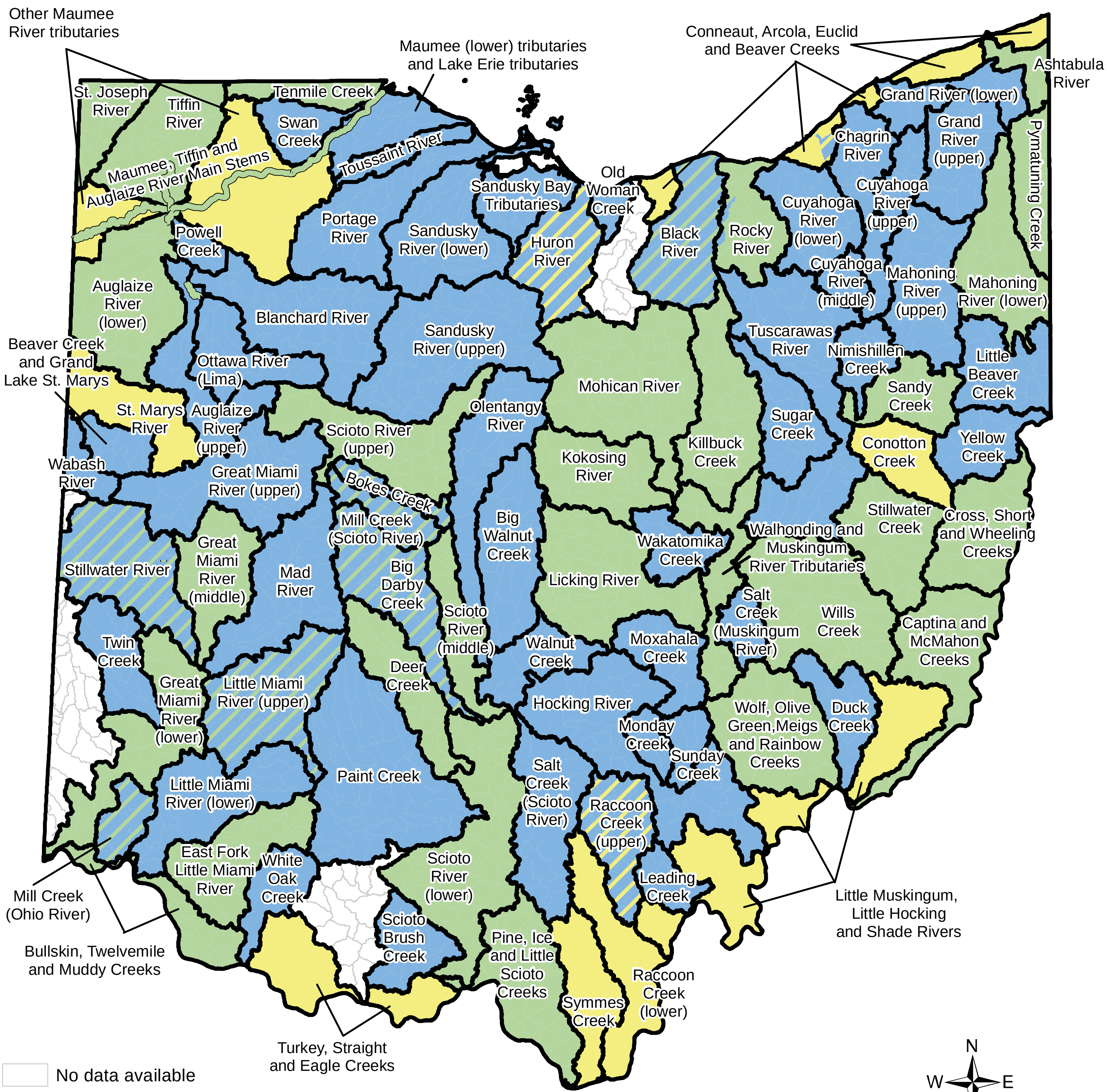
Ohio 2016 Integrated Report



Ohio Environmental Protection Agency

Updated 8/24/2016

Ohio Total Maximum Daily Load Program Progress*



No data available

Approved by U.S. EPA*

First cycle TMDL approved by U.S. EPA*; second cycle TMDL under development

First cycle TMDL approved by U.S. EPA*; second cycle watershed assessment in progress

TMDL under development

Watershed assessment in progress

Updated 6/27/2016

* While Ohio has completed TMDLs for the project areas shown and they were approved by USEPA, in 2015 the Ohio Supreme Court determined that "A TMDL established pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act.". See page C-17 for more details.

- TMDLs for total phosphorus and total suspended sediment in the Wabash River basin were established by USEPA in 2004, and TMDLs for fecal coliform in the Mahoning River basin were established by USEPA in 2004. These are not impacted by the Ohio Supreme Court decision.

Ohio Environmental Protection Agency

Section

L

Summary Tables of Waterbody Conditions; Lists of Prioritized Impaired Waters; and Monitoring and TMDL Schedules

Section L contains tables showing the 303(d) listing details for each of the assessment unit types and is divided into five sections as follows:

1) Section L1: Status of Watershed Assessment Units

2) Section L2: Status of Large River Assessment Units

3) Section L3: Status of Lake Erie Assessment Units

4) Section L4: Section 303(d) List of Prioritized Impaired Waters

5) Section L5: Category 4B demonstrations contained in approved Ohio TMDLs to date

In Sections L1 through L4, there are four columns labeled, in order: “Human Health,” “Recreation,” “Aquatic Life” and “PDW Supply.” These four columns represent each beneficial use included in the 303(d) list of impaired waters and the numbers in the columns represent the category for that assessment unit for that beneficial use. Table L-1 (below) defines that categories and subcategories assigned to each use.

Table L-1. Category definitions for the 2016 Integrated Report and 303(d) list

Category[1]		Subcategory	
0	No waters currently utilized for water supply		
1	Use attaining	d	TMDL complete; new data show the AU is attaining water quality standards
		h	Historical data
		t	TMDL complete at 11-digit hydrologic unit code (HUC) scale; AU is attaining water quality standards at 12-HUC scale
		x	Retained from 2008 IR
2	Not applicable in Ohio system		
3	Use attainment unknown	h	Historical data
		i	Insufficient data
		t	TMDL complete at 11-HUC scale; there may be no or not enough data to assess this assessment unit at the 12-HUC scale
		x	Retained from 2008 IR
4	Impaired; TMDL not needed	A	TMDL complete[2]
		B	Other required control measures will result in attainment of use
		C	Not a pollutant
		h	Historical data
		n	Natural causes and sources
		x	Retained from 2008 IR
5	Impaired; TMDL needed	M	Mercury
		alt	Alternative restoration approaches
		d	TMDL complete; new data show the AU is not attaining water quality standards
		h	Historical data
		x	Retained from 2008 IR

[1] Shading indicates categories defined by U.S. EPA; additional categories and subcategories are defined by Ohio EPA.

[2] While Ohio has completed these TMDLs and they were approved by U.S. EPA, in March 2015 in *Fairfield Cty. Bd. of Commrs. v. Nally,* 143 Ohio St. 3d 93, 2015-Ohio-991, the Ohio Supreme Court determined that "A TMDL established by Ohio EPA pursuant to the Clean Water Act is a rule that is subject to the requirements of R.C. Chapter 119, the Ohio Administrative Procedure Act." See Section C (page C-17) for more details.

Section L1. Status of Watershed Assessment Units

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100001 03 01	Shantee Creek	15.81	5h	5	5	0	6	2026
04100001 03 02	Halfway Creek	39.89	5h	5	5	0	7	2026
04100001 03 03	Prairie Ditch	18.63	5h	5	1	0	6	2026
04100001 03 04	Headwaters Tenmile Creek	48.29	1	5	5	0	7	2026
04100001 03 05	North Tenmile Creek	40.51	5h	5	5	0	7	2026
04100001 03 06	Tenmile Creek	14.97	5h	5	5	0	7	2026
04100001 03 07	Heldman Ditch-Ottawa River	28.15	5	5	5	0	9	2026
04100001 03 08	Sibley Creek-Ottawa River	22.35	5	5	5	0	7	2026
04100001 03 09	Detwiler Ditch-Frontal Lake Erie	7.43	3	1	5	0	1	2026
04100002 03 01	Headwaters Bear Creek	17.8	3	1	1	0	0	2026
04100002 03 03	Nile Ditch	24.6	3	3	3	0	0	2026
04100002 03 04	Little Bear Creek-Bear Creek	21.8	3	5	5	0	4	2026
04100003 01 04	Bird Creek-East Branch St Joseph River	29.61	3	3	3	0	0	2028
04100003 01 06	Clear Fork-East Branch St Joseph River	49.95	1	5	4n	0	3	2028
04100003 02 04	West Branch St Joseph River	16.27	5	5	5	0	10	2028
04100003 03 01	Nettle Creek	36.43	1	5	5	0	8	2028
04100003 03 02	Cogswell Cemetery-St Joseph River	9.76	5	5	1	0	5	2028
04100003 03 03	Eagle Creek	35	5h	5	5	0	9	2028
04100003 03 04	Village of Montpelier-St Joseph River	20.83	5h	5	1	0	4	2028
04100003 03 05	Bear Creek	24.45	5h	5	1	0	6	2028
04100003 03 06	West Buffalo Cemetery-St Joseph River	13.72	5h	5	1	0	5	2028
04100003 04 02	Headwaters Fish Creek	13.86	3	5	1	0	3	2028
04100003 04 05	Town of Alvarado-Fish Creek	16.07	3	3	3	0	0	2028
04100003 04 06	Cornell Ditch-Fish Creek	24.72	3i	5	1	0	3	2028
04100003 05 01	Bluff Run-St Joseph River	23.74	5h	5	1	0	5	2028
04100003 05 02	Big Run	30.21	5h	5	1	0	5	2028
04100003 05 03	Russell Run-St Joseph River	17.98	5h	5	1	0	5	2028
04100003 05 05	Willow Run-St Joseph River	16.46	5	5	1	0	8	2028
04100003 05 06	Sol Shank Ditch-St Joseph River	27.28	5h	3	3	0	2	2028
04100004 01 01	Muddy Creek	16.46	5h	5	5hx	0	6	2015

Section L1. Status of Watershed Assessment Units

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100004 01 02	Center Branch St Marys River	29	5h	5	5hx	0	7	2015
04100004 01 03	East Branch St Marys River	21.26	5h	5	5hx	0	4	2015
04100004 01 04	Kopp Creek	33.82	5h	5	5	0	5	2015
04100004 01 05	Sixmile Creek	17.61	5h	5	5hx	0	6	2015
04100004 01 06	Fourmile Creek-St Marys River	16.5	1	5	5	0	5	2015
04100004 02 01	Hussey Creek	12.37	5h	5	5hx	0	6	2015
04100004 02 02	Eightmile Creek	22.45	5h	1	5hx	0	3	2015
04100004 02 03	Blierdofer Ditch	14.57	5h	5	5hx	0	4	2015
04100004 02 04	Twelvemile Creek	23.58	5h	5	5hx	0	7	2015
04100004 02 05	Prairie Creek-St Marys River	42.22	5	5	5hx	0	7	2015
04100004 03 01	Little Black Creek	24.95	5h	5	3x	0	3	2015
04100004 03 02	Black Creek	29.52	5h	5	3x	0	5	2015
04100004 03 03	Yankee Run-St Marys River	59.44	1	5	3x	0	4	2015
04100004 03 04	Duck Creek	15.89	5h	5	3x	0	5	2015
04100004 03 05	Town of Willshire-St Marys River	13.4	1	5	3x	0	4	2015
04100004 04 01	Twentyseven Mile Creek	28.7	3	5	3x	0	3	2015
04100004 04 04	Little Blue Creek	16.61	3	3	3x	0	0	2015
04100005 02 01	Zuber Cutoff	36.86	3	5	5hx	0	5	2015
04100005 02 02	North Chaney Ditch-Maumee River	18.44	3	3	5hx	0	4	2015
04100005 02 03	Marie DeLarme Creek	49.04	3	5	5hx	0	8	2015
04100005 02 04	Gordon Creek	44.15	3	5	5hx	0	6	2015
04100005 02 05	Sixmile Cutoff-Maumee River	15.7	3	3	5hx	0	4	2015
04100005 02 06	Platter Creek	21.68	3	5	5hx	0	8	2015
04100005 02 07	Sulphur Creek-Maumee River	18.22	3	5	5hx	0	8	2015
04100005 02 08	Snooks Run-Maumee River	24.95	3	5	5hx	0	8	2015
04100006 02 01	Silver Creek-Bean Creek	21.65	3	3	3	0	0	2028
04100006 02 02	Deer Creek-Bean Creek	31.73	3	5	5	0	6	2028
04100006 02 03	Old Bean Creek	33.33	3	1	1	0	0	2028
04100006 02 04	Mill Creek	40.74	3	5	5	0	7	2028
04100006 02 05	Stag Run-Bean Creek	14.45	3	5	1	0	3	2028

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100006 03 01	Bates Creek-Tiffin River	29.29	1	5	5	1	7	2028
04100006 03 02	Leatherwood Creek	17.34	5h	1	5	0	3	2028
04100006 03 03	Flat Run-Tiffin River	33.17	5	5	5	3i	11	2028
04100006 04 01	Upper Lick Creek	28	3	5	5	0	7	2028
04100006 04 02	Middle Lick Creek	30.86	3	5	5	0	4	2028
04100006 04 03	Prairie Creek	29.78	3	5	5	0	6	2028
04100006 04 04	Lower Lick Creek	17.39	3i	5	1	0	3	2028
04100006 05 01	Beaver Creek	45.14	5h	5	5	0	7	2028
04100006 05 02	Brush Creek	66.01	5h	5	5	0	10	2028
04100006 05 03	Village of Stryker-Tiffin River	25.25	5	5	1	0	7	2028
04100006 05 04	Coon Creek-Tiffin River	30.21	3	5	4n	0	3	2028
04100006 06 01	Lost Creek	32.33	3	5	5	0	6	2028
04100006 06 02	Mud Creek	26.6	1h	5	5	0	7	2028
04100006 06 03	Webb Run	20.39	3	5	4n	0	4	2028
04100006 06 04	Buckskin Creek-Tiffin River	20.96	5h	1	4n	0	2	2028
04100007 01 01	Headwaters Auglaize River	42.4	5h	4Ahx	1ht	0	2	2018
04100007 01 02	Blackhoof Creek	16.3	5h	4Ahx	4Ah	0	2	2018
04100007 01 03	Wrestle Creek-Auglaize River	29.88	5h	4Ahx	4Ah	0	2	2018
04100007 01 04	Pusheta Creek	34.65	5h	4Ahx	1ht	0	2	2018
04100007 01 05	Dry Run-Auglaize River	24.23	3i	4A	4Ah	0	0	2018
04100007 02 01	Two Mile Creek	31.72	5h	4Ahx	4Ah	0	2	2018
04100007 02 02	Village of Buckland-Auglaize River	9.98	1	4Ahx	1ht	0	0	2018
04100007 02 03	Sims Run-Auglaize River	28.8	1	4Ahx	4Ah	3i	0	2018
04100007 02 04	Sixmile Creek-Auglaize River	29.9	5	5	4Ah	0	4	2018
04100007 03 01	Upper Hog Creek	21.68	5h	3	1	0	2	2025
04100007 03 02	Middle Hog Creek	30.44	5h	4A	1	0	2	2025
04100007 03 03	Little Hog Creek	22.23	5h	4A	4A	0	2	2025
04100007 03 04	Lower Hog Creek	16.11	5h	4A	4A	0	2	2025
04100007 03 05	Lost Creek	17.41	1	1d	4A	3i	1	2025
04100007 03 06	Lima Reservoir-Ottawa River	27.36	5	4A	5	3	4	2025

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100007 04 01	Little Ottawa River	16.42	5h	4A	4A	0	2	2025
04100007 04 02	Dug Run-Ottawa River	13.27	5h	4A	5	0	6	2025
04100007 04 03	Honey Run	28.04	5h	4A	4A	5	7	2025
04100007 04 04	Pike Run	13.24	5h	4A	1	0	2	2025
04100007 04 05	Leatherwood Ditch	13.46	5h	4A	1	0	2	2025
04100007 04 06	Beaver Run-Ottawa River	20.84	5h	4A	1	0	2	2025
04100007 05 01	Sugar Creek	64.14	5h	4A	1	0	2	2025
04100007 05 02	Plum Creek	39.84	5h	4A	5	0	6	2025
04100007 05 03	Village of Kalida-Ottawa River	20.58	5h	4A	1	0	2	2025
04100007 06 01	Kyle Prairie Creek	19.05	3	5	1	0	4	2029
04100007 06 02	Long Prairie Creek-Little Auglaize River	26.19	3	5	1	0	4	2029
04100007 06 03	Wolf Ditch-Little Auglaize River	21.2	1	5	1	0	2	2029
04100007 06 04	Dry Fork-Little Auglaize River	57.07	1	5	1	1	6	2029
04100007 07 01	Hagarman Creek	16.15	3	5	1	0	4	2029
04100007 07 02	West Branch Prairie Creek	50.54	1	5	1	0	2	2029
04100007 07 03	Prairie Creek	39.22	1	1	1	0	0	2029
04100007 08 01	Dog Creek	57.69	5	5	1	0	4	2029
04100007 08 02	Upper Town Creek	14.4	3	5	5	0	6	2029
04100007 08 03	Maddox Creek	33.76	3	5	1	0	4	2029
04100007 08 04	Lower Town Creek	38.72	5	5	1	1	6	2029
04100007 08 05	Middle Creek	16.4	3i	1	1	0	0	2029
04100007 08 06	Burt Lake-Little Auglaize River	13.93	1	1	1	0	0	2029
04100007 09 01	Upper Jennings Creek	26.99	5h	4Ahx	1ht	0	2	2018
04100007 09 02	West Jennings Creek	13.95	5h	4Ahx	1ht	0	2	2018
04100007 09 03	Lower Jennings Creek	28.13	5h	4A	4Ah	0	2	2018
04100007 09 04	Big Run-Auglaize River	21.03	1	4A	1ht	0	0	2018
04100007 09 05	Lapp Ditch-Auglaize River	21.23	3	4Ahx	1ht	0	0	2018
04100007 09 06	Prairie Creek	13.8	5h	4Ahx	4Ah	0	2	2018
04100007 09 07	Town of Oakwood-Auglaize River	16.5	3	4Ahx	3t	0	0	2018
04100007 10 01	Upper Prairie Creek	15.29	3	5	5	0	6	2029

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100007 10 02	Upper Blue Creek	25.53	3	5	1	0	3	2029
04100007 10 03	Middle Blue Creek	19.45	3	5	1	0	4	2029
04100007 10 04	Lower Blue Creek	48.13	3i	5	5	0	7	2029
04100007 10 05	Town of Charloe-Auglaize River	21.95	3	5	5	0	5	2029
04100007 11 01	North Powell Creek	46.81	3	3	4A	0	0	2021
04100007 11 02	Upper Powell Creek	38.83	3i	3	4A	0	0	2021
04100007 11 03	Lower Powell Creek	12.87	3i	5h	4A	0	1	2021
04100007 12 01	Headwaters Flatrock Creek	24.55	3	5	1	0	3	2029
04100007 12 04	Brown Ditch-Flatrock Creek	24.39	3	3	3	0	0	2029
04100007 12 05	Wildcat Creek-Flatrock Creek	55.82	3	5	5	0	7	2029
04100007 12 06	Big Run-Flatrock Creek	48.28	5	5	5	1	12	2029
04100007 12 07	Little Flatrock Creek	17.83	3	5	5	0	6	2029
04100007 12 08	Sixmile Creek	28.31	3	5	1	0	3	2029
04100007 12 09	Eagle Creek-Auglaize River	34.27	3i	5	5	3i	3	2029
04100008 01 01	Cessna Creek	23.21	5h	4Ah	4A	0	2	2020
04100008 01 02	Headwaters Blanchard River	19.66	5h	4Ah	4A	0	2	2020
04100008 01 03	The Outlet-Blanchard River	34.1	5h	4Ah	4A	0	2	2020
04100008 01 04	Potato Run	27.85	5h	4Ah	4A	0	2	2020
04100008 01 05	Ripley Run-Blanchard River	36.94	5h	4A	4A	0	2	2020
04100008 02 01	Brights Ditch	28.45	5h	4Ah	3i	0	2	2020
04100008 02 02	The Outlet	38.36	5h	4Ah	1	0	2	2020
04100008 02 03	Findlay Upground Reservoirs-Blanchard River	22.5	5h	4Ah	4A	3i	3	2020
04100008 02 04	Lye Creek	27.56	5h	4Ah	4A	0	2	2020
04100008 02 05	City of Findlay Riverside Park-Blanchard River	16.22	1	4Ah	4A	3i	0	2020
04100008 03 01	Upper Eagle Creek	26.37	5h	4Ah	4A	0	2	2020
04100008 03 02	Lower Eagle Creek	34.01	5h	4A	4A	0	2	2020
04100008 03 03	Aurand Run	18.03	5h	4Ah	1	0	2	2020
04100008 03 04	Howard Run-Blanchard River	36.28	5	4A	4A	0	2	2020
04100008 04 01	Binkley Ditch-Little Riley Creek	14.36	3	4Ah	4A	0	0	2020
04100008 04 02	Upper Riley Creek	14.35	3	4Ah	4A	0	0	2020

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre- ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100008 04 03	Marsh Run-Little Riley Creek	16.25	3	4Ah	4A	0	0	2020
04100008 04 04	Middle Riley Creek	15.62	3	4A	4A	0	0	2020
04100008 04 05	Lower Riley Creek	25.14	3	4A	4A	0	0	2020
04100008 05 01	Tiderishi Creek	19.17	5h	4Ah	4A	0	2	2020
04100008 05 02	Ottawa Creek	44.92	5h	4Ah	4A	0	2	2020
04100008 05 03	Moffitt Ditch	13.54	5h	4Ah	4A	0	2	2020
04100008 05 04	Dukes Run	15.02	5h	4Ah	4A	0	2	2020
04100008 05 05	Dutch Run	14.76	5h	4Ah	1	0	2	2020
04100008 05 06	Village of Gilboa-Blanchard River	41.2	3i	4Ah	1	0	0	2020
04100008 06 01	Cranberry Creek	45.26	3	4Ah	1	0	0	2020
04100008 06 02	Pike Run-Blanchard River	28.64	3	4A	4A	3i	0	2020
04100008 06 03	Miller City Cutoff	22.64	3	4Ah	4A	0	0	2020
04100008 06 04	Bear Creek	12.67	3	4Ah	1	0	0	2020
04100008 06 05	Deer Creek-Blanchard River	39.36	3	4Ah	4A	0	0	2020
04100009 01 01	West Creek	15.95	3	5	5hx	0	4	2015
04100009 01 02	Upper South Turkeyfoot Creek	21.03	3	5	5hx	0	5	2015
04100009 01 03	School Creek	38.87	3	5	5hx	0	5	2015
04100009 01 04	Middle South Turkeyfoot Creek	36.24	3	5	5hx	0	4	2015
04100009 01 05	Little Turkeyfoot Creek	23.12	3	5	5hx	0	2	2015
04100009 01 06	Lower South Turkeyfoot Creek	13.79	3	5	5hx	0	4	2015
04100009 02 01	Preston Run-Maumee River	17.09	3	5	5hx	0	7	2015
04100009 02 02	Benien Creek	24.03	3	5	5hx	0	7	2015
04100009 02 03	Wade Creek-Maumee River	37.31	3	5	5hx	0	5	2015
04100009 02 04	Garret Creek	28.59	3	5	5hx	0	5	2015
04100009 02 05	Oberhaus Creek	24	3	5	5hx	0	5	2015
04100009 02 06	Village of Napoleon-Maumee River	21.33	3	5	5hx	0	5	2015
04100009 02 07	Creager Cemetery-Maumee River	17.91	3	5	5hx	0	5	2015
04100009 03 01	Upper Bad Creek	22.81	3	1	5hx	0	1	2015
04100009 03 02	Lower Bad Creek	41.46	1h	5	5hx	5	9	2015
04100009 04 01	Konzen Ditch	25.21	3	1	5hx	3i	5	2015

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100009 04 02	North Turkeyfoot Creek	50.01	3	5	5hx	3i	10	2015
04100009 04 03	Dry Creek-Maumee River	27.36	3	5	5hx	0	8	2015
04100009 05 01	Big Creek	21.52	3	5	5hx	0	6	2015
04100009 05 02	Hammer Creek	25.09	3	5	5hx	0	6	2015
04100009 05 03	Upper Beaver Creek	16.71	3	5	5hx	0	4	2015
04100009 05 04	Upper Yellow Creek	34.63	3	5	5hx	0	5	2015
04100009 05 05	Brush Creek	25.11	3	5	5hx	0	7	2015
04100009 05 06	Lower Yellow Creek	22.67	3	1	5hx	0	3	2015
04100009 05 07	Cutoff Ditch	22.06	3	5	5hx	0	6	2015
04100009 05 08	Middle Beaver Creek	23.46	3	5	5hx	0	4	2015
04100009 05 09	Lower Beaver Creek	16.78	3	5	5hx	0	7	2015
04100009 05 10	Lick Creek-Maumee River	23.39	3	3	5hx	0	3	2015
04100009 06 01	Tontogany Creek	45.3	3	5	3x	0	4	2015
04100009 06 02	Sugar Creek-Maumee River	21.72	3	5	3x	0	1	2015
04100009 06 03	Haskins Road Ditch-Maumee River	15.73	3	5	3x	5	9	2015
04100009 07 01	Ai Creek	50.83	3	4A	4A	0	0	2017
04100009 07 02	Fewless Creek-Swan Creek	28.34	3	4Ah	4A	3i	1	2017
04100009 07 03	Gale Run-Swan Creek	16.91	3	4Ah	4A	0	0	2017
04100009 08 01	Upper Blue Creek	20.28	3	4Ah	3i	0	0	2017
04100009 08 02	Lower Blue Creek	24.49	3	4Ah	4A	0	0	2017
04100009 08 03	Wolf Creek	27.16	3	4Ah	4A	0	0	2017
04100009 08 04	Heilman Ditch-Swan Creek	36.88	5	4Ah	4A	0	2	2017
04100009 09 01	Grassy Creek Diversion	24.78	3	4Ah	3i	0	0	2017
04100009 09 02	Grassy Creek	13.68	3i	4Ah	4A	0	0	2017
04100009 09 03	Crooked Creek-Maumee River	18.89	3	3	3	0	0	2017
04100009 09 04	Delaware Creek-Maumee River	19.25	3i	4Ah	4A	0	0	2017
04100010 01 01	Rader Creek	32.71	3	4A	4A	3i	1	2021
04100010 01 02	Needles Creek	31.42	3	4Ah	4A	0	0	2021
04100010 01 03	Rocky Ford	73.53	3	4A	4A	3i	1	2021
04100010 01 04	Town of Rudolph-Middle Branch Portage River	31.14	3	4Ah	1	0	0	2021

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100010 02 01	Bull Creek	30.47	3	4Ah	4A	0	0	2021
04100010 02 02	East Branch Portage River	36.15	1	4Ah	5	3i	5	2021
04100010 02 03	Town of Bloomdale-South Branch Portage River	53.57	3i	4Ah	5	3i	4	2021
04100010 02 04	Rhodes Ditch-South Branch Portage River	20.66	5	4Ah	1	0	2	2021
04100010 02 05	Cessna Ditch-Middle Branch Portage River	25.44	3	4Ah	1	0	0	2021
04100010 03 01	North Branch Portage River	64.41	5	4A	5	0	6	2021
04100010 03 02	Town of Pemberville-Portage River	18.06	5h	4Ah	1	0	2	2021
04100010 04 01	Sugar Creek	59.39	5h	4A	4A	0	2	2021
04100010 04 02	Larcarpe Creek Outlet #4-Portage River	27.89	5h	4A	4A	0	2	2021
04100010 05 01	Little Portage River	32.63	5h	4Ah	4A	0	2	2021
04100010 05 02	Portage River	48.86	5	4A	5	0	3	2021
04100010 05 03	Lacarpe Creek-Frontal Lake Erie	40.3	3	3	3	0	0	2021
04100010 06 01	Upper Tousant Creek	74	5h	5	4Ah	0	4	2017
04100010 06 02	Packer Creek	34.49	5h	3	4Ah	0	2	2017
04100010 06 03	Lower Toussaint Creek	30.67	5	3	4Ah	0	2	2017
04100010 07 01	Turtle Creek-Frontal Lake Erie	40.66	3	4Ah	4A	0	0	2017
04100010 07 02	Crane Creek-Frontal Lake Erie	56.48	3	4Ah	4A	0	0	2017
04100010 07 03	Cedar Creek-Frontal Lake Erie	58.05	3	4Ah	4A	0	0	2017
04100010 07 04	Wolf Creek-Frontal Lake Erie	15.16	3	4Ah	3i	0	0	2017
04100010 07 05	Berger Ditch	16.06	3	4Ah	4A	0	0	2017
04100010 07 06	Otter Creek-Frontal Lake Erie	18.13	3i	4Ah	4A	0	0	2017
04100011 01 01	Sawmill Creek	14.28	3	4A	1	0	0	2024
04100011 01 02	Pipe Creek-Frontal Sandusky Bay	48.54	3	4A	4A	0	0	2024
04100011 01 03	Mills Creek	42.17	3i	5	4A	3i	3	2024
04100011 02 01	Frontal South Side of Sandusky Bay	43.42	3	4A	4A	0	0	2024
04100011 02 02	Strong Creek	15.87	3	4A	3	0	0	2024
04100011 02 03	Pickerel Creek	48.48	3i	4A	4A	0	0	2024
04100011 02 04	Raccoon Creek	34.41	3i	4A	5	5	6	2024
04100011 02 05	South Creek	22	3	4A	4A	0	0	2024
04100011 03 01	Brandywine Creek-Broken Sword Creek	55.3	3	4Ahx	4A	0	0	2021

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04100011 03 02	Indian Run-Broken Sword Creek	39.04	3	4Ahx	4Ah	0	0	2021
04100011 04 01	Headwaters Paramour Creek-Sandusky River	27.95	5h	4A	4Ah	0	2	2019
04100011 04 02	Loss Creek-Sandusky River	24.26	5h	4Ahx	4A	0	2	2019
04100011 04 03	Headwaters Middle Sanduskey River	37.44	5h	4A	4Ah	3	3	2019
04100011 04 04	Grass Run	24.52	5h	4Ahx	4Ah	0	2	2019
04100011 04 05	Headwaters Lower Sandusky River	24.07	5h	4Ahx	4Ah	0	2	2019
04100011 05 01	Prairie Run	14.27	3	4Ahx	1ht	0	0	2019
04100011 05 02	Headwaters Tymochtee Creek	20.69	3	4Ahx	4Ah	0	0	2019
04100011 05 03	Carroll Ditch	14.56	3	4Ahx	3iht	0	0	2019
04100011 05 04	Paw Paw Run	16.8	3	4Ahx	4Ah	0	0	2019
04100011 05 05	Reevhorn Run	15.35	3	4Ahx	3iht	0	0	2019
04100011 05 06	Upper Little Tymochtee Creek	19.12	3	4Ahx	4Ah	0	0	2019
04100011 05 07	Lower Little Tymochtee Creek	17.81	3	4Ahx	4Ah	0	0	2019
04100011 05 08	Warpole Creek	20.68	3	4Ahx	3iht	0	0	2019
04100011 05 09	Enoch Creek-Tymochtee Creek	35.17	3	4Ahx	4Ah	0	0	2019
04100011 06 01	Oak Run	15.3	3	3	3t	0	0	2019
04100011 06 02	Baughman Run-Tymochtee Creek	27.34	3	3	4Ah	0	0	2019
04100011 06 03	Hart Ditch-Little Tymochtee Creek	31.52	3	3	4Ah	0	0	2019
04100011 06 04	Spring Run	29.94	3	5	4Ah	0	2	2019
04100011 06 05	Mouth Tymochtee Creek	26.11	1h	5	4Ah	0	2	2019
04100011 07 01	Little Sandusky River	36.04	1h	4Ahx	4Ah	0	0	2019
04100011 07 02	Town of Upper Sandusky-Sandusky River	29.07	5h	4A	4Ah	3i	2	2019
04100011 07 03	Negro Run	13.66	5h	4Ahx	1ht	0	2	2019
04100011 07 04	Cranberry Run-Sandusky River	21.38	5h	4Ahx	4Ah	0	2	2019
04100011 07 05	Sugar Run-Sandusky River	18.69	5h	4Ahx	4Ah	0	2	2019
04100011 08 01	Brokenknife Creek	18.9	3	3	4Ah	0	0	2019
04100011 08 02	Upper Honey Creek	40.96	3	3	4Ah	0	0	2019
04100011 08 03	Aicholz Ditch	18.04	3	3	4Ah	0	0	2019
04100011 08 04	Silver Creek	24.62	3	3	4Ah	0	0	2019
04100011 08 05	Middle Honey Creek	41.31	3	5	4Ah	3	3	2019

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04100011 08 06	Lower Honey Creek	35.56	3	5	1ht	0	4	2019
04100011 09 01	Taylor Run	19.29	3	3	4Ah	0	0	2019
04100011 09 02	Headwaters Sycamore Creek	40.55	3	3	1ht	0	0	2019
04100011 09 03	Greasy Run-Sycamore Creek	23.99	3	5	4Ah	0	4	2019
04100011 09 04	Thorn Run-Sandusky River	21.36	3	3	4Ah	0	0	2019
04100011 09 05	Mile Run-Sandusky River	16.69	3	3	4Ah	0	0	2019
04100011 10 01	East Branch East Branch Wolf Creek	21.9	3	4Ah	4A	0	0	2024
04100011 10 02	Town of New Riegel-East Branch Wolf Creek	33.4	3	4Ah	4A	0	0	2024
04100011 10 03	Snuff Creek-East Branch Wolf Creek	29.22	3	4Ah	1	0	0	2024
04100011 10 04	Wolf Creek	73.45	3	4A	4A	0	0	2024
04100011 11 01	Rock Creek	34.78	3	3	4Ah	0	0	2024
04100011 11 02	Morrison Creek	20.34	3	3	4Ah	0	0	2024
04100011 11 03	Willow Creek-Sandusky River	16.62	3	3	4Ah	0	0	2024
04100011 11 04	Sugar Creek	13.52	3	3	1	0	0	2024
04100011 11 05	Spicer Creek-Sandusky River	30.86	3	3	4A	0	0	2024
04100011 12 01	Westerhouse Ditch	20.68	3	4Ah	1	0	0	2024
04100011 12 02	Beaver Creek	29.3	3i	4Ah	4A	5	5	2024
04100011 12 03	Green Creek	30.78	1	5	4A	5	9	2024
04100011 13 01	Muskellunge Creek	46.31	3i	4Ah	4A	0	0	2024
04100011 13 02	Indian Creek-Sandusky River	37.59	3	4Ah	3i	0	0	2024
04100011 13 03	Mouth Sandusky River	24.85	3	3	4A	0	0	2024
04100011 14 01	Gries Ditch	13.93	3	4Ah	1	0	0	2024
04100011 14 02	Town of Helena-Muddy Creek	45.21	3	4Ah	1	0	0	2024
04100011 14 03	Little Muddy Creek	28.58	3	5h	4A	0	3	2024
04100011 14 04	Town of Lindsey-Muddy Creek	24.12	5	4Ah	4A	0	2	2024
04100011 14 05	North Side Sandusky Bay Frontal	26.53	3	3	3	0	0	2024
04100012 01 01	Clear Creek-Vermilion River	22.22	5h	3	5h	0	3	2021
04100012 01 02	Buck Creek	20.88	5h	3	5h	0	3	2021
04100012 01 03	Southwest Branch Vermilion River	31.16	5h	5	5h	0	6	2021
04100012 01 04	New London Upground Reservoir-Vermilion River	31.05	5h	3	5h	3	5	2021

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100012 01 05	Indian Creek-Vermilion River	34.51	5h	3	5h	0	5	2021
04100012 02 01	East Branch Vermilion River	37.52	5h	3	5h	0	3	2021
04100012 02 02	East Fork Vermilion River	35.05	5h	3	5	0	6	2021
04100012 02 03	Town of Wakeman-Vermilion River	28.91	5h	3	5h	0	6	2021
04100012 02 04	Mouth Vermilion River	28.13	5h	5	5h	1	10	2021
04100012 03 01	Sugar Creek-Frontal Lake Erie	19.5	3	3	4Ah	0	0	2021
04100012 03 02	Chappel Creek	23.99	3	3	4Ah	0	0	2021
04100012 03 03	Cranberry Creek-Frontal Lake Erie	12.64	3	3	3t	0	0	2021
04100012 03 04	Old Woman Creek	26.49	3	5	4Ah	0	2	2021
04100012 04 01	Marsh Run	31.49	3	4Ahx	4Ah	0	0	2016
04100012 04 02	Town of Plymouth-West Branch Huron River	31	3	4A	4Ah	0	0	2016
04100012 04 03	Walnut Creek-West Branch Huron River	23.69	3	4Ahx	1ht	3	0	2016
04100012 04 04	Holliday Lake	13.73	3	1t	4Ah	0	0	2016
04100012 04 05	Peru Township-West Branch Huron River	32.3	3	4Ahx	4Ah	0	0	2016
04100012 05 01	Mud Run	15.54	3	3	4Ah	0	0	2016
04100012 05 02	Slate Run	31.01	3	3	4Ah	0	0	2016
04100012 05 03	Frink Run	29.77	3i	3	4Ah	3i	2	2016
04100012 05 04	Seymour Creek	16.2	3	3	1ht	0	0	2016
04100012 05 05	Unnamed Creek "C"	15.97	3	3	1ht	0	0	2016
04100012 05 06	Mouth West Branch Huron River	21.51	3	5	1ht	3i	5	2016
04100012 06 01	Headwaters East Branch Huron River	28.94	3	4Ahx	4Ah	0	0	2016
04100012 06 02	Cole Creek	23.05	3	4Ahx	1ht	0	0	2016
04100012 06 03	Norwalk Creek	20.54	1h	4Ahx	4Ah	5	5	2016
04100012 06 04	Mouth East Branch Huron River	15.29	3	4Ahx	1ht	3	0	2016
04100012 06 05	Unnamed Creek "B"	18.16	3	4A	4Ah	0	0	2016
04100012 06 06	Huron River-Frontal Lake Erie	44.81	5	4A	4Ah	0	2	2016
04110001 01 01	Plum Creek	12.87	5h	5	5	0	8	2029
04110001 01 02	North Branch West Branch Rocky River	25.07	5h	5	5	0	7	2029
04110001 01 03	Headwaters West Branch Rocky River	22.98	5h	5	5	0	6	2029
04110001 01 04	Mallet Creek	18.04	5h	1	1	0	2	2029

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04110001 01 05	City of Medina-West Branch Rocky River	26.37	1	5	1	0	4	2029
04110001 01 06	Cossett Creek-West Branch Rocky River	41.44	1	5	4n	0	4	2029
04110001 01 07	Plum Creek	17.54	5h	5	5	0	6	2029
04110001 01 08	Baker Creek-West Branch Rocky River	26.08	5	5	5	0	9	2029
04110001 02 01	Headwaters East Branch Rocky River	40.56	1	5	1	0	4	2029
04110001 02 02	Baldwin Creek-East Branch Rocky River	36.58	1	5	5	1	6	2029
04110001 02 03	Rocky River	25.34	5	5	5	0	11	2029
04110001 02 04	Cahoon Creek-Frontal Lake Erie	38.43	3	5	5	0	2	2029
04110001 03 01	East Fork of East Branch Black River	14.17	5h	4A	5d	0	3	2027
04110001 03 02	Headwaters West Fork East Branch Black River	43.41	5h	4A	5d	0	6	2027
04110001 03 03	Coon Creek-East Branch Black River	38.31	1h	4A	4C	0	0	2027
04110001 04 01	Town of Litchfield-East Branch Black River	36.06	1	4A	1d	0	0	2027
04110001 04 02	Salt Creek-East Branch Black River	33.93	1	4A	4n	0	0	2027
04110001 04 03	Willow Creek	22.58	5h	4A	4A	0	2	2027
04110001 04 04	Jackson Ditch-East Branch Black River	33.63	5	4A	4C	0	2	2027
04110001 05 01	Charlemont Creek	26.08	1h	4A	5d	1	1	2027
04110001 05 02	Upper West Branch Black River	40.13	5h	4A	4A	0	3	2027
04110001 05 03	Wellington Creek	29.61	1	4A	4A	0	0	2027
04110001 05 04	Middle West Branch Black River	25.68	5h	4A	4A	0	2	2027
04110001 05 05	Plum Creek	13.81	5h	4A	5d	0	3	2027
04110001 05 06	Lower West Branch Black River	39.18	5	4A	4A	3	2	2027
04110001 06 01	French Creek	38.44	5h	4A	5	0	6	2027
04110001 06 02	Black River	35.38	5	4A	5	0	4	2027
04110001 06 03	Heider Ditch-Frontal Lake Erie	26.3	3	4A	5d	0	1	2027
04110001 07 01	Headwaters Beaver Creek	19.38	3	5	3x	0	3	2015
04110001 07 02	Mouth Beaver Creek	25.44	3	5	4C	0	4	2015
04110001 07 03	Quarry Creek-Frontal Lake Erie	25.59	3	5	3x	0	1	2015
04110002 01 01	East Branch Reservoir-East Branch Cuyahoga River	18.58	1	1h	4Ah	5	0	2018
04110002 01 02	West Branch Cuyahoga River	35.98	5h	5	4Ah	0	11	2018
04110002 01 03	Tare Creek-Cuyahoga River	22.92	5h	1	4Ah	0	2	2018

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04110002 01 04	Ladue Reservoir-Bridge Creek	38.79	5	1h	4Ah	5	2	2018
04110002 01 05	Black Brook	12.72	5h	3	1ht	0	7	2018
04110002 01 06	Sawyer Brook-Cuyahoga River	20.44	1h	3	4Ah	0	0	2018
04110002 02 01	Potter Creek-Breakneck Creek	34.18	5h	5	4Ah	0	5	2018
04110002 02 02	Feeder Canal-Breakneck Creek	45.04	5h	5	4Ah	1	6	2018
04110002 02 03	Lake Rockwell-Cuyahoga River	61.33	5	5	4Ah	5	6	2018
04110002 03 01	Plum Creek	12.97	5h	3	1ht	0	7	2018
04110002 03 02	Mogadore Reservoir-Little Cuyahoga River	12.91	1	3	4Ah	0	0	2018
04110002 03 03	Wingfoot Lake outlet-Little Cuyahoga River	30.79	5	5	5	0	7	2018
04110002 03 04	City of Akron-Little Cuyahoga River	19.66	5h	5	4A	0	3	2018
04110002 03 05	Fish Creek-Cuyahoga River	35.41	5	5	4A	0	8	2018
04110002 04 01	Mud Brook	29.77	1h	4Ahx	4Ah	0	0	2018
04110002 04 02	Yellow Creek	31.21	5h	4A	4A	0	2	2018
04110002 04 03	Furnace Run	20.3	5h	4A	4A	0	2	2018
04110002 04 04	Brandywine Creek	27.06	5h	4Ahx	4Ah	0	2	2018
04110002 04 05	Boston Run-Cuyahoga River	46.44	5	4Ax	4A	0	2	2018
04110002 05 01	Pond Brook	16.62	5h	5	5	0	8	2018
04110002 05 02	Headwaters Tinkers Creek	25.25	5h	5	5	0	7	2018
04110002 05 03	Headwaters Chippewa Creek	17.82	5h	3	4Ah	0	2	2018
04110002 05 04	Town of Twinsburg-Tinkers Creek	55.53	5h	5	5	0	9	2018
04110002 05 05	Willow Lake-Cuyahoga River	24.23	3	3	4A	0	0	2018
04110002 06 01	Mill Creek	19.26	3	4Ahx	4A	0	0	2018
04110002 06 02	Village of Independence-Cuyahoga River	16.97	3	4Ahx	4Ah	0	0	2018
04110002 06 03	Big Creek	37.37	3	4Ahx	4A	0	0	2018
04110002 06 04	Cuyahoga Heights-Cuyahoga River	19.08	3	4Ahx	4A	0	0	2018
04110002 06 05	City of Cleveland-Cuyahoga River	23.58	3	4Ahx	3t	0	0	2018
04110003 01 01	East Branch Ashtabula River	37.3	5h	5	4n	0	5	2026
04110003 01 02	West Branch Ashtabula River	27.7	5h	5	1	0	6	2026
04110003 01 03	Upper Ashtabula River	23.28	5h	5	1	0	6	2026
04110003 01 04	Middle Ashtabula River	30.35	1h	5	1	0	4	2026

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04110003 01 05	Lower Ashtabula River	18.27	5	5	5	0	10	2026
04110003 02 01	Indian Creek-Frontal Lake Erie	29.21	3	5	5hx	0	8	2015
04110003 02 02	Wheeler Creek-Frontal Lake Erie	32.83	3	5	5hx	0	7	2015
04110003 02 03	Arcola Creek	23.53	3	5	5hx	0	8	2015
04110003 02 04	McKinley Creek-Frontal Lake Erie	29.67	3	5	5hx	0	7	2015
04110003 03 01	Silver Creek	13.83	3	5h	1t	0	4	2021
04110003 03 02	Headwaters Aurora Branch	37.5	3	5	5d	0	6	2021
04110003 03 03	McFarland Creek-Aurora Branch	20.42	3	5	4A	0	4	2021
04110003 03 04	Beaver Creek-Chagrin River	47.48	3	5	4A	0	4	2021
04110003 04 01	East Branch Chagrin River	51.33	3	4Ahx	4A	0	0	2021
04110003 04 02	Griswold Creek-Chagrin River	76.54	5	4A	5	0	5	2021
04110003 04 03	Town of Willoughby-Chagrin River	17.97	3	4Ahx	4A	0	0	2021
04110003 05 01	Marsh Creek-Frontal Lake Erie	28.33	3	5	3	0	1	2015
04110003 05 02	City of Euclid-Frontal Lake Erie	20.57	3	3	3	0	0	2015
04110003 05 03	Euclid Creek	23.31	3	5	5	0	5	2015
04110003 05 04	Doan Brook-Frontal Lake Erie	45.29	3	5	5	0	2	2015
04110004 01 01	Dead Branch	24.17	5h	4Ah	3i	0	2	2019
04110004 01 02	Headwaters Grand River	33.21	5h	4A	4A	1	2	2019
04110004 01 03	Baughman Creek	18.44	5h	4Ah	4n	0	3	2019
04110004 01 04	Center Creek-Grand River	31.43	3	4Ah	4A	0	0	2019
04110004 01 05	Coffee Creek-Grand River	19.03	3	4Ah	1	0	0	2019
04110004 01 06	Swine Creek	31	5h	4Ah	1	0	2	2019
04110004 02 01	Upper Rock Creek	26.02	5h	4Ah	3i	0	2	2019
04110004 02 02	Middle Rock Creek	21.37	1h	4Ah	4A	0	0	2019
04110004 02 03	Lower Rock Creek	23.56	5h	1d	4A	0	2	2019
04110004 03 01	Phelps Creek	29.36	5h	4Ah	4n	0	2	2019
04110004 03 02	Hoskins Creek	26.87	5h	4Ah	4A	0	2	2019
04110004 03 03	Mill Creek-Grand River	35.81	5h	4A	4A	0	2	2019
04110004 03 04	Mud Creek	21.07	5h	4Ah	4A	0	2	2019
04110004 03 05	Plumb Creek-Grand River	19.24	5h	4Ah	1	0	2	2019

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04110004 04 01	Griggs Creek	20.68	1h	4Ah	4nh	0	0	2019
04110004 04 02	Peters Creek-Mill Creek	54.81	1	4Ah	4Ah	0	0	2019
04110004 04 03	Town of Jefferson-Mill Creek	28.17	5	4A	5	0	5	2019
04110004 05 01	Three Brothers Creek-Grand River	21.71	5h	4Ah	4n	0	2	2019
04110004 05 02	Bronson Creek-Grand River	36.11	1h	4Ah	4n	0	0	2019
04110004 06 01	Coffee Creek-Grand River	22.01	3	4A	3ih	0	0	2019
04110004 06 02	Mill Creek	20.99	3	4Ah	1h	0	0	2019
04110004 06 03	Village of Mechanicsville-Grand River	16.62	3	3	3	0	0	2019
04110004 06 04	Paine Creek	28.83	3	4Ah	4nh	0	0	2019
04110004 06 05	Talcott Creek-Grand River	19.32	3	1h	3ih	0	0	2019
04110004 06 06	Big Creek	50.42	3	4A	4Ah	0	0	2019
04110004 06 07	Red Creek-Grand River	26.3	3	4Ah	4Ah	0	0	2019
04120101 04 09	Turkey Creek-Frontal Lake Erie	24.65	3	3	3	0	0	2015
04120101 06 03	West Branch Conneaut Creek	15.72	3	3	3	0	0	2015
04120101 06 05	Marsh Run-Conneaut Creek	68.47	3i	5	1	0	6	2015
04120101 06 06	Town of North Kingsville-Frontal Lake Erie	23.57	3	5	3	0	4	2015
05030101 04 01	East Branch Middle Fork Little Beaver Creek	31.02	5h	5	4Ah	0	6	2020
05030101 04 02	Headwaters Middle Fork Little Beaver Creek	41.42	5	3	4Ah	0	2	2020
05030101 04 03	Stone Mill Run-Middle Fork Little Beaver Creek	31.65	5h	3	4Ah	3	2	2020
05030101 04 04	Lisbon Creek-Middle Fork Little Beaver Creek	19.72	5h	5	4Ah	0	5	2020
05030101 04 05	Elk Run-Middle Fork Little Beaver Creek	24.72	5	3	4Ah	0	2	2020
05030101 05 01	Cold Run	14.48	3	3	1ht	3	0	2020
05030101 05 02	Headwaters West Fork Little Beaver Creek	17.82	3	5	4Ah	0	3	2020
05030101 05 03	Brush Creek	27.2	3	3	4Ah	0	0	2020
05030101 05 04	Patterson Creek-West Fork Little Beaver Creek	52.42	3	5	4Ah	0	1	2020
05030101 06 01	Longs Run	14.81	5h	3	4Ah	0	2	2020
05030101 06 02	Honey Creek	24.24	5h	5	4Ah	0	5	2020
05030101 06 03	Headwaters North Fork Little Beaver Creek	28.73	5h	3	1ht	0	2	2020
05030101 06 04	Little Bull Creek	17.45	5h	3	1ht	0	2	2020
05030101 06 05	Headwaters Bull Creek	18.29	5h	5	4Ah	0	3	2020

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05030101 06 06	Leslie Run-Bull Creek	20.15	5h	5	4Ah	0	4	2020
05030101 06 07	Dilworth Run-North Fork Little Beaver Creek	56.95	5h	3	1ht	0	2	2020
05030101 06 08	Brush Run-North Fork Little Beaver Creek	27.52	5h	3	1ht	0	2	2020
05030101 06 09	Rough Run-Little Beaver Creek	18.11	5h	3	1ht	0	2	2020
05030101 06 10	Bieler Run-Little Beaver Creek	16.69	5h	5	1ht	0	8	2020
05030101 07 01	Headwaters Yellow Creek	31.99	5h	4Ah	4A	0	2	2020
05030101 07 02	Elkhorn Creek	33.56	5h	4Ah	1	0	2	2020
05030101 07 03	Upper North Fork	19.17	5h	5h	1	0	4	2020
05030101 07 04	Long Run-Yellow Creek	34.23	5	4Ah	4n	0	2	2020
05030101 08 01	Town Fork	25.99	1	5h	4A	0	2	2020
05030101 08 02	Headwaters North Fork Yellow Creek	26.53	5h	5	4A	0	6	2020
05030101 08 03	Salt Run-North Fork Yellow Creek	28.73	5h	4Ah	4A	0	2	2020
05030101 08 04	Hollow Rock Run-Yellow Creek	39.29	5	5h	4A	0	4	2020
05030101 10 01	Upper Cross Creek	23.29	5h	5h	5	0	8	2025
05030101 10 02	Salem Creek	15.3	5h	5h	5	0	9	2025
05030101 10 03	Middle Cross Creek	14.49	5h	5h	1	0	3	2025
05030101 10 04	McIntyre Creek	27.37	1	5h	5	0	6	2025
05030101 10 05	Lower Cross Creek	47.3	5	5h	5	0	6	2025
05030101 11 02	Little Yellow Creek	22.75	1h	3	4A	0	0	2025
05030101 11 03	Carpenter Run-Ohio River	36.37	1h	3	4A	0	0	2025
05030101 11 06	Hardin Run-Ohio River	41.94	1	1h	1	0	0	2025
05030101 11 07	Island Creek	26.35	3	1h	1	0	0	2025
05030101 11 09	Wills Creek-Ohio River	37.02	3	1h	1	0	0	2025
05030102 01 04	Frontal Pymatuning Reservoir	42.67	5h	5	5	0	7	2023
05030102 01 05	Pymatuning Reservoir	25.49	1	3	3	0	0	2023
05030102 03 01	Headwaters Pymatuning Creek	60.96	3	5h	4n	0	4	2023
05030102 03 02	Sugar Creek-Pymatuning Creek	35.18	3	5h	5	0	5	2023
05030102 03 03	Stratton Creek-Pymatuning Creek	19.31	3	5h	4n	0	4	2023
05030102 03 04	Booth Run-Pymatuning Creek	59.75	1	5h	4C	0	6	2023
05030102 04 01	Sugar Run-Shenango River	31.28	3	3	3	0	0	2023

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05030102 06 01	Yankee Run	44.81	3	5	5	0	5	2023
05030102 06 02	Little Yankee Run	43.58	3	5	5	0	6	2023
05030102 06 03	McCullough Run-Shenango River	36.78	3	3	3	0	0	2023
05030102 06 06	Deer Creek-Shenango River	53.77	3	3	3	0	0	2023
05030103 01 01	Beaver Run-Mahoning River	41.14	3	4Ah	4A	0	0	2022
05030103 01 02	Beech Creek	31.64	3	4A	5	0	3	2022
05030103 01 03	Fish Creek-Mahoning River	56.7	5	4A	5	1	3	2022
05030103 02 01	Deer Creek	37.56	5	4A	4A	1	2	2022
05030103 02 02	Willow Creek	20.02	5h	4Ah	4A	0	4	2022
05030103 02 03	Mill Creek	32.42	5h	4Ah	5	0	3	2022
05030103 02 04	Island Creek-Mahoning River	29.05	5	4A	5	3	3	2022
05030103 03 01	Kale Creek	25.52	5h	4Ah	5	0	3	2022
05030103 03 02	Headwaters West Branch Mahoning River	31.11	5h	4Ah	5	0	4	2022
05030103 03 03	Barrel Run	12.43	5h	4Ah	4A	0	2	2022
05030103 03 04	Kirwin Reservoir-West Branch Mahoning River	37.29	5	4Ah	5	1	4	2022
05030103 03 05	Town of Newton Falls-West Branch Mahoning River	27.53	1	4Ah	4A	0	0	2022
05030103 03 06	Charley Run Creek-Mahoning River	33.16	5	4A	4A	1	2	2022
05030103 04 01	Headwaters Eagle Creek	20.79	5h	4A	4n	0	2	2022
05030103 04 02	South Fork Eagle Creek	26.18	5h	4A	1	0	2	2022
05030103 04 03	Camp Creek-Eagle Creek	26.3	5h	4A	4A	0	2	2022
05030103 04 04	Tinkers Creek	16.48	5h	4Ah	4A	0	2	2022
05030103 04 05	Mouth Eagle Creek	20.7	1	4Ah	1	0	0	2022
05030103 04 06	Chocolate Run-Mahoning River	16.57	3i	4Ah	5	0	1	2022
05030103 05 01	Upper Mosquito Creek	25.85	3	5	4n	0	4	2028
05030103 05 02	Middle Mosquito Creek	71.5	1	5	1	1	2	2028
05030103 05 03	Lower Mosquito Creek	40.92	5	5	5	0	5	2028
05030103 06 01	Duck Creek	33.24	3	5	5	0	4	2028
05030103 06 02	Mud Creek	14.19	3	5	5	0	4	2028
05030103 06 03	City of Warren-Mahoning River	40.38	3	5	5	0	2	2028
05030103 07 01	Upper Meander Creek	23.09	3	5	4n	0	3	2028

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05030103 07 02	Middle Meander Creek	32.34	3	5	4n	0	4	2028
05030103 07 03	Lower Meander Creek	30.68	5	5	5	1	7	2028
05030103 07 04	Squaw Creek	18.63	3	3	5	0	1	2028
05030103 07 05	Little Squaw Creek-Mahoning River	26.14	3	5	4C	0	4	2028
05030103 08 01	Headwaters Mill Creek	37.05	3	5	5	0	4	2028
05030103 08 02	Indian Run	14.28	3	5	5	0	4	2028
05030103 08 03	Andersons Run-Mill Creek	27.11	1	5	5	0	4	2028
05030103 08 04	Crab Creek	21.07	3	5	1	0	3	2028
05030103 08 05	Headwaters Yellow Creek	19.36	3	5	5	1	5	2028
05030103 08 06	Burgess Run-Yellow Creek	20.19	5h	5	5	1	10	2028
05030103 08 07	Dry Run-Mahoning River	25.38	3	5	4n	3	3	2028
05030103 08 08	Hickory Run	27.11	3	3	3	0	0	2028
05030103 08 09	Coffee Run-Mahoning River	49.56	3	5	5h	0	4	2028
05030106 02 01	South Fork Short Creek	14.48	3	1h	5	0	1	2025
05030106 02 02	Middle Fork Short Creek	24.16	3	5	5	0	7	2025
05030106 02 03	North Fork Short Creek	22.16	3	5h	5	0	4	2025
05030106 02 04	Piney Fork	22.58	3	5	1	0	1	2025
05030106 02 05	Perrin Run-Short Creek	26.22	3	5h	1	0	4	2025
05030106 02 06	Little Short Creek	17.63	3	1h	5	0	1	2025
05030106 02 07	Dry Fork-Short Creek	20.49	5	5h	1	0	6	2025
05030106 03 01	Crabapple Creek	19.66	5h	5h	5	0	9	2025
05030106 03 02	Headwaters Wheeling Creek	25.52	5h	1	5	0	3	2025
05030106 03 03	Cox Run-Wheeling Creek	39.3	5	5	5	1	9	2025
05030106 03 04	Flat Run-Wheeling Creek	23.29	5h	5	5	0	6	2025
05030106 07 01	Williams Creek	12.38	3	1h	1	0	0	2024
05030106 07 02	Upper McMahon Creek	38.11	3	5h	1	0	4	2024
05030106 07 03	Little McMahon Creek	14.92	3	1h	5	1	3	2024
05030106 07 04	Lower McMahon Creek	25.77	5	1h	1	0	2	2024
05030106 09 01	North Fork Captina Creek	32.72	1	5	1	1	5	2024
05030106 09 02	South Fork Captina Creek	35.99	1	5	4n	1	2	2024

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05030106 09 03	Bend Fork	27.02	3	5	1	0	3	2024
05030106 09 04	Piney Creek-Captina Creek	29.07	3i	5	1	0	5	2024
05030106 09 05	Pea Vine Creek-Captina Creek	38.02	5	1	1	0	2	2024
05030106 09 06	Cat Run-Captina Creek	17.45	3i	1	4n	0	0	2024
05030106 12 01	Rush Run	12.48	3	5h	5	0	6	2025
05030106 12 02	Salt Run-Ohio River	29.37	3	5h	5	0	5	2025
05030106 12 04	Glenns Run-Ohio River	31.29	3	5	5	0	4	2025
05030106 12 05	Boggs Run-Ohio River	16.89	3	3	3	0	0	2025
05030106 12 06	Wegee Creek-Ohio River	38.1	3	1h	4n	0	0	2025
05030106 12 07	Pipe Creek-Ohio River	35.14	3	1h	5	0	1	2025
05030106 12 08	Big Run-Ohio River	11.12	3	3	5h	0	1	2025
05030201 01 01	Upper Sunfish Creek	35.1	3	1h	1	5	5	2024
05030201 01 02	Piney Fork	15.61	3	1h	1	0	0	2024
05030201 01 03	Middle Sunfish Creek	19.88	3	5	1	0	5	2024
05030201 01 04	Lower Sunfish Creek	43.12	3i	1h	1	0	0	2024
05030201 06 01	Rich Fork	22.41	3	5	1h	0	4	2015
05030201 06 02	Cranenest Fork	26.31	3	5	1h	0	4	2015
05030201 06 03	Wolfpen Run-Little Muskingum River	21.25	3	5	5h	0	8	2015
05030201 06 04	Witten Fork	42.36	3	5	1h	0	4	2015
05030201 06 05	Straight Fork-Little Muskingum River	36.7	3i	5	1h	0	4	2015
05030201 07 01	Clear Fork Little Muskingum River	48.82	3	1	1h	0	0	2015
05030201 07 02	Archers Fork	18.55	3	5	1h	0	4	2015
05030201 07 03	Wingett Run-Little Muskingum River	36.34	3i	5	5h	0	6	2015
05030201 07 04	Fifteen Mile Creek	20.52	3	5	1h	0	3	2015
05030201 07 05	Eightmile Creek-Little Muskingum River	41.68	5	5	5h	0	8	2015
05030201 08 01	Upper East Fork Duck Creek	31.64	3	3	4Ah	0	0	2020
05030201 08 02	Middle Fork Duck Creek	26.5	3	3	4Ah	0	0	2020
05030201 08 03	Middle East Fork Duck Creek	40.33	3	3	4Ah	0	0	2020
05030201 08 04	Paw Paw Creek	23.42	3	3	4Ah	0	0	2020
05030201 08 05	Lower East Fork Duck Creek	14.33	3	3	4Ah	0	0	2020

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05030201 09 01	Headwaters West Fork Duck Creek	74.68	1h	5	4Ah	1	4	2020
05030201 09 02	Buffalo Run-West Fork Duck Creek	31.8	5h	3	4Ah	0	2	2020
05030201 09 03	New Years Creek-Duck Creek	25.47	5h	3	4Ah	0	2	2020
05030201 09 04	Sugar Creek-Duck Creek	17.72	5	3	4Ah	0	2	2020
05030201 10 01	Stillhouse Run-Ohio River	19.45	3	3	3t	0	0	2024
05030201 10 02	Opossum Creek	25.31	3	1h	1	0	0	2024
05030201 10 04	Haynes Run-Ohio River	30.29	3	3	3	0	0	2024
05030201 10 05	Patton Run-Ohio River	32.14	3	3	3i	0	0	2024
05030201 10 06	Mill Creek-Ohio River	43.28	3	5	3i	0	4	2024
05030201 10 07	Leith Run-Ohio River	26.8	3	1h	3i	0	0	2024
05030201 10 09	Cow Creek-Ohio River	48.14	3	5h	3i	0	1	2024
05030201 10 10	Bull Creek-Ohio River	43.08	3	3	3	0	0	2024
05030202 01 02	Mile Run-Ohio River	40.28	3	5	3x	0	3	2015
05030202 01 03	Headwaters Little Hocking River	35.55	3	5	3x	0	4	2015
05030202 01 04	West Branch Little Hocking River	39.45	3	5	3x	0	4	2015
05030202 01 05	Little West Branch Little Hocking River-Little Hocking River	27.31	3	5	3x	0	4	2015
05030202 01 06	Sandy Creek-Ohio River	40.07	3	5	3x	0	3	2015
05030202 02 01	Headwaters West Branch Shade River	22.19	3	5	3x	0	1	2015
05030202 02 02	Kingsbury Creek	21.45	3	5	3x	0	4	2015
05030202 02 03	Headwaters Middle Branch Shade River	40.09	3	5	3x	0	4	2015
05030202 02 04	Elk Run-Middle Branch Shade River	17.57	3	5	3x	0	3	2015
05030202 02 05	Walker Run-West Branch Shade River	27.69	3	5	3x	0	4	2015
05030202 03 01	Horse Cave Creek	18.4	5h	5	3x	0	5	2015
05030202 03 02	Headwaters East Branch Shade River	37.53	5h	5	3x	0	5	2015
05030202 03 03	Big Run-East Branch Shade River	17.49	5h	5	3x	0	6	2015
05030202 03 04	Spruce Creek-Shade River	18.8	5h	5	3x	0	4	2015
05030202 04 04	Forked Run-Ohio River	35.85	1	3	3x	0	0	2015
05030202 07 01	Headwaters Leading Creek	13.37	3	5h	4A	0	3	2018
05030202 07 02	Mud Fork	13.25	3	3	4A	0	0	2018

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05030202 07 03	Ogden Run-Leading Creek	23.89	3	1h	1t	0	0	2018
05030202 07 04	Little Leading Creek	25.51	3	5h	4A	0	4	2018
05030202 07 05	Thomas Fork	31.13	3	1h	4A	0	0	2018
05030202 07 06	Parker Run-Leading Creek	42.91	3	5h	4A	0	2	2018
05030202 08 02	Groundhog Creek-Ohio River	37.57	1h	5	3x	0	1	2015
05030202 08 03	Oldtown Creek-Ohio River	29.66	1h	5	3x	0	3	2015
05030202 08 04	West Creek-Ohio River	52.74	1	5	3x	0	1	2015
05030202 08 05	Broad Run-Ohio River	50.96	1h	3	3x	0	0	2015
05030202 09 01	Kyger Creek	30.49	3	5	5	0	5	2015
05030202 09 02	Campaign Creek	46.61	3	5	5hx	0	5	2015
05030202 09 04	Crooked Creek-Ohio River	44.54	3	3	5hx	0	1	2015
05030204 01 01	Center Branch	24.83	1	4A	4Ah	3	1	2019
05030204 01 02	Headwaters Rush Creek	45.54	3	5	4Ah	3	2	2019
05030204 01 03	Clark Run-Rush Creek	28.49	3	4Ah	4Ah	0	0	2019
05030204 02 01	Headwaters Little Rush Creek	28.42	3	4Ah	1ht	0	0	2019
05030204 02 02	Indian Creek-Little Rush Creek	32.93	3	4Ah	4Ah	0	0	2019
05030204 02 03	Raccoon Run	27.35	3	4Ah	4Ah	0	0	2019
05030204 02 04	Turkey Run-Rush Creek	47.34	1	4A	4Ah	0	0	2019
05030204 03 01	Headwaters Clear Creek	47.79	3	5h	1h	0	2	2019
05030204 03 02	Mouth Clear Creek	43.69	3i	5h	1h	0	2	2019
05030204 04 01	Headwaters Hocking River	47.66	1h	4A	4Ah	0	0	2019
05030204 04 02	Baldwin Run	12.61	5h	4A	5	0	3	2019
05030204 04 03	Pleasant Run	17.71	5h	4Ah	1ht	0	2	2019
05030204 04 04	Tarhe Run-Hocking River	20.64	5h	4A	4Ah	0	2	2019
05030204 04 05	Buck Run-Hocking River	32.05	5h	4Ah	4Ah	0	2	2019
05030204 05 01	Little Monday Creek	25.15	3	5h	4Ah	0	2	2019
05030204 05 02	Lost Run-Monday Creek	36.54	3	5h	4A	0	2	2019
05030204 05 03	Snow Fork	27.28	3	5h	4Ah	0	4	2019
05030204 05 04	Kitchen Run-Monday Creek	27.02	3	5h	4A	0	2	2019
05030204 06 01	Clear Fork	16.03	1h	4Ah	4Ah	0	0	2019

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05030204 06 02	Scott Creek	23.68	5h	1h	4Ah	0	2	2019
05030204 06 03	Oldtown Creek	13.81	5h	1h	1ht	0	2	2019
05030204 06 04	Fivemile Creek	14.22	5h	1h	4Ah	0	2	2019
05030204 06 05	Harper Run-Hocking River	26.94	3	4A	4Ah	0	0	2019
05030204 06 06	Dorr Run-Hocking River	32.79	3	4A	4Ah	0	0	2019
05030204 07 01	East Branch Sunday Creek	33.13	1	4A	4Ah	1	0	2019
05030204 07 02	Dotson Creek-Sunday Creek	24.18	3	4A	4A	0	0	2019
05030204 07 03	West Branch Sunday Creek	42.49	3	4A	4A	0	0	2019
05030204 07 04	Greens Run-Sunday Creek	39.06	3	4A	4A	0	0	2019
05030204 08 01	Hamley Run-Hocking River	22.21	3	4Ah	4Ah	0	0	2019
05030204 08 02	Headwaters Margaret Creek	33.07	3	4A	4Ah	0	0	2019
05030204 08 03	Factory Creek-Margaret Creek	26.93	3	4Ah	4Ah	0	0	2019
05030204 08 04	Coates Run-Hocking River	19.61	3	4Ah	1ht	0	0	2019
05030204 09 01	Miners and Hyde Forks	16.55	3	4Ah	1ht	0	0	2019
05030204 09 02	McDougall Branch	37.56	3	4Ah	1ht	0	0	2019
05030204 09 03	Kasler Creek-Federal Creek	15.51	3	4Ah	4nh	0	0	2019
05030204 09 04	Sharps Fork	35.71	3	4Ah	4Ah	0	0	2019
05030204 09 05	Big Run-Federal Creek	39.36	3	4Ah	4A	0	0	2019
05030204 10 01	Willow Creek-Hocking River	31.64	1	5	4Ah	0	4	2019
05030204 10 02	Piper Run-Hocking River	20.57	3	3	3t	0	0	2019
05030204 10 03	Fourmile Creek	16.19	1h	3	1ht	0	0	2019
05030204 10 04	Frost Run-Hocking River	41.84	3	3	4Ah	0	0	2019
05040001 01 01	Headwaters Tuscarawas River	35.82	5h	4A	4A	0	2	2017
05040001 01 02	Pigeon Creek	24.7	5h	4Ah	4Ah	0	2	2017
05040001 01 03	Hudson Run	13.76	5h	4Ah	4Ah	0	2	2017
05040001 01 04	Wolf Creek	39.16	5h	4A	4Ah	5	7	2017
05040001 01 05	Portage Lakes-Tuscarawas River	36.87	5	4A	4Ah	0	2	2017
05040001 02 01	Headwaters Chippewa Creek	22.35	5h	4Ah	4A	0	2	2017
05040001 02 02	Hubbard Creek-Chippewa Creek	21.8	5h	4Ah	4Ah	0	2	2017
05040001 02 03	Little Chippewa Creek	32.16	5h	5	4Ah	0	4	2017

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05040001 02 04	River Styx	29.55	5h	4A	4Ah	0	2	2017
05040001 02 05	Tommy Run-Chippewa Creek	36.68	5h	4A	4Ah	0	2	2017
05040001 02 06	Red Run	15.16	5h	4A	4Ah	0	2	2017
05040001 02 07	Silver Creek-Chippewa Creek	30.24	5h	4Ah	4Ah	0	2	2017
05040001 03 01	Pancake Creek-Tuscarawas River	22.61	5h	4A	4Ah	0	2	2017
05040001 03 02	Nimisila Reservoir-Nimisila Creek	17.41	1	4Ah	4Ah	0	0	2017
05040001 03 03	Lake Lucern-Nimisila Creek	14.15	5h	4Ah	1ht	0	2	2017
05040001 03 04	Fox Run	14.19	5h	4Ah	4Ah	0	2	2017
05040001 03 05	Town of Canal Fulton-Tuscarawas River	14.49	3	4A	3t	0	0	2017
05040001 03 06	Headwaters Newman Creek	24.88	5h	4A	4Ah	0	2	2017
05040001 03 07	Town of North Lawrence-Newman Creek	14.59	5h	4Ah	1ht	0	2	2017
05040001 03 08	Sippo Creek	18.09	5h	4Ah	4Ah	0	2	2017
05040001 03 09	West Sippo Creek-Tuscarawas River	29.63	3	4Ah	4Ah	0	0	2017
05040001 04 01	Conser Run	15.51	5h	5h	4n	0	3	2025
05040001 04 02	Middle Branch Sandy Creek	15.57	5h	5h	1	0	3	2025
05040001 04 03	Pipes Fork-Still Fork	34.81	5h	5h	1	0	3	2025
05040001 04 04	Muddy Fork	17.14	5h	5h	5	0	9	2025
05040001 04 05	Reeds Run-Still Fork	19.47	5h	5h	5	0	9	2025
05040001 04 06	Headwaters Sandy Creek	32.13	5	5	5	0	9	2025
05040001 05 01	Swartz Ditch-Middle Branch Nimishillen Creek	25.27	5h	4A	4Ah	0	2	2017
05040001 05 02	East Branch Nimishillen Creek	46.62	5h	4A	5	0	3	2017
05040001 05 03	West Branch Nimishillen Creek	46.69	5h	4A	5	0	3	2017
05040001 05 04	City of Canton-Middle Branch Nimishillen Creek	26.02	5h	4Ah	5	0	3	2017
05040001 05 05	Sherrick Run-Nimishillen Creek	22.75	5h	4Ah	5	0	3	2017
05040001 05 06	Town of East Sparta-Nimishillen Creek	20.58	5h	4A	4A	0	2	2017
05040001 06 01	Hugle Run	21.4	5h	5h	1	0	5	2025
05040001 06 02	Pipe Run	27.71	5h	5h	4n	0	5	2025
05040001 06 03	Black Run	16.39	5h	5h	1	0	5	2025
05040001 06 04	Little Sandy Creek	21.15	5h	5h	1	0	5	2025
05040001 06 05	Armstrong Run-Sandy Creek	32.2	5	5	1	0	8	2025

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05040001 06 06	Indian Run-Sandy Creek	39.78	5h	5	5	0	9	2025
05040001 06 07	Beal Run-Sandy Creek	22.85	5	1	5	0	5	2025
05040001 07 01	Headwaters Upper Conotton Creek	13.95	3	3	3x	0	0	2016
05040001 07 02	Irish Creek	18.85	3	3	3x	0	0	2016
05040001 07 03	Dining Fork	14.79	3	3	3x	0	0	2016
05040001 07 04	Headwaters Middle Conotton Creek	15.21	3	5	3x	0	1	2016
05040001 07 05	North Fork McGuire Creek	26.67	3	3	3x	0	0	2016
05040001 07 06	McGuire Creek	22.97	3	3	3x	0	0	2016
05040001 07 07	Headwaters Lower Conotton Creek	29.5	3	3	3x	0	0	2016
05040001 08 01	Cold Spring Run-Indian Fork	32.86	3	1	3x	0	0	2016
05040001 08 02	Pleasant Valley Run-Indian Fork	37.49	3	3	3x	1	0	2016
05040001 08 03	Thompson Run-Conotton Creek	24.96	3	3	3x	0	0	2016
05040001 08 04	Huff Run	13.94	3	1	5	0	1	2016
05040001 08 05	Dog Run-Conotton Creek	35.23	3	1	3x	0	0	2016
05040001 09 01	Little Sugar Creek	18.19	3	4A	4Ah	0	0	2017
05040001 09 02	Town of Smithville-Sugar Creek	28.17	3	4A	4Ah	0	0	2017
05040001 09 03	North Fork Sugar Creek	18.01	3	4A	4Ah	0	0	2017
05040001 09 04	Town of Brewster-Sugar Creek	33.11	3	4Ahx	4Ah	0	0	2017
05040001 10 01	Upper South Fork Sugar Creek	35.03	3	4A	4Ah	0	0	2017
05040001 10 02	East Branch South Fork Sugar Creek	28.2	3	4Ahx	4Ah	0	0	2017
05040001 10 03	Indian Trail Creek	16.38	3	4Ahx	4Ah	0	0	2017
05040001 10 04	Walnut Creek	31.67	3	4A	4Ah	0	0	2017
05040001 10 05	Lower South Fork Sugar Creek	26.54	3	4Ahx	4Ah	0	0	2017
05040001 11 01	Headwaters Middle Fork Sugar Creek	27.73	3	4Ahx	1ht	0	0	2017
05040001 11 02	Misers Run-Middle Fork Sugar Creek	19.53	3	4Ahx	4Ah	0	0	2017
05040001 11 03	Beach City Reservoir-Sugar Creek	17.57	3	4A	4Ah	0	0	2017
05040001 11 04	Broad Run	19.65	3	4Ahx	4Ah	0	0	2017
05040001 11 05	Brandywine Creek-Sugar Creek	36.91	3i	4A	4A	0	0	2017
05040001 12 01	Pigeon Run	9.57	3	4Ah	1ht	0	0	2017
05040001 12 02	City of Massillon-Tuscarawas River	14.32	3	4Ah	3t	0	0	2017

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05040001 12 03	Wolf Creek-Tuscarawas River	52.14	3	4A	4Ah	0	0	2017
05040001 12 04	Wolf Run-Tuscarawas River	37.17	3	4Ah	4Ah	0	0	2017
05040001 13 01	Spencer Creek	24.03	3	5	5	0	6	2027
05040001 13 02	Headwaters Stillwater Creek	13.58	3	5	1	0	4	2027
05040001 13 03	Boggs Fork	36.74	3	5	5	0	8	2027
05040001 13 04	Buttermilk Creek-Stillwater Creek	47.99	1	1	3i	0	0	2027
05040001 14 01	Skull Fork	46.37	3	5	5	0	7	2027
05040001 14 02	Brushy Fork	70.03	1	5	5	0	3	2027
05040001 14 03	Craborchard Creek-Stillwater Creek	42.84	1	5	1	0	2	2027
05040001 15 01	Clear Fork	24.98	3	5	5	0	4	2027
05040001 15 02	Standingstone Fork	16.41	3	5	5	0	2	2027
05040001 15 03	Upper Little Stillwater Creek	29.72	1	1	3	5	5	2027
05040001 15 04	Middle Little Stillwater Creek	25.24	3	1	5	0	1	2027
05040001 15 05	Lower Little Stillwater Creek	14.69	3	1	5	0	3	2027
05040001 16 01	Laurel Creek	28.73	3	5	5	0	7	2027
05040001 16 02	Crooked Creek	18.97	3	5	1	0	3	2027
05040001 16 03	Weaver Run-Stillwater Creek	16.12	1	1	5	0	1	2027
05040001 16 04	Town of Uhrichsville-Stillwater Creek	29.02	3	5	5	3	7	2027
05040001 17 01	Stone Creek	38.47	3	4Ah	4Ah	0	0	2017
05040001 17 02	Oldtown Creek	19.26	3	4Ah	4Ah	0	0	2017
05040001 17 03	Beaverdam Creek	21.97	3	4Ah	4A	0	0	2017
05040001 17 04	Pone Run-Tuscarawas River	21.39	3	1d	3t	0	0	2017
05040001 18 01	Dunlap Creek	25.41	3	4Ah	4Ah	0	0	2017
05040001 18 02	Mud Run-Tuscarawas River	52.38	3	4Ah	4Ah	0	0	2017
05040001 18 03	Buckhorn Creek	23.32	3	4Ah	4Ah	0	0	2017
05040001 18 04	Blue Ridge Run-Tuscarawas River	22.66	3	4Ah	3t	0	0	2017
05040001 19 01	Evans Creek	24.25	3i	4Ah	1ht	0	0	2017
05040001 19 02	West Fork White Eyes Creek	20.95	3	4Ah	1ht	0	0	2017
05040001 19 03	White Eyes Creek	33.09	3	4Ah	4Ah	0	0	2017
05040001 19 04	Morgan Run-Tuscarawas River	38.32	3	4Ah	4Ah	0	0	2017

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05040002 01 01	Marsh Run	20.84	3	5h	5	3i	7	2023
05040002 01 02	Headwaters Black Fork Mohican River	39.47	3	5	5	3i	7	2023
05040002 01 03	Brubaker Creek	23	3	5h	5	0	2	2023
05040002 01 04	Whetstone Creek	17.14	3	5h	1	0	3	2023
05040002 01 05	Shipp Creek-Black Fork Mohican River	61.62	3	5h	5	0	7	2023
05040002 02 01	Village of Pavonia-Black Fork Mohican River	31.94	5h	1	5	0	5	2023
05040002 02 02	Seymour Run-Black Fork	21.65	1h	3	3	0	0	2023
05040002 02 03	Headwaters Rocky Fork	29.41	5h	5h	5	0	6	2023
05040002 02 04	Outlet Rocky Fork	47.81	5h	5	5	0	9	2023
05040002 02 05	Charles Mill-Black Fork Mohican River	8.97	5h	1h	5	0	3	2023
05040002 03 01	Headwaters Clear Fork Mohican River	33.78	5	1h	3i	1	2	2023
05040002 03 02	Cedar Fork	47.69	3	5h	1	0	4	2023
05040002 03 03	Town of Lexington-Clear Fork Mohican River	29.63	3	5	5	0	9	2023
05040002 04 01	Honey Creek-Clear Fork Mohican River	24.63	3	5	1	0	5	2023
05040002 04 02	Possum Run	15.62	3	5h	1	0	4	2023
05040002 04 03	Slater Run-Clear Fork Mohican River	22.89	3	5h	1	0	5	2023
05040002 04 04	Pine Run	14.15	3	1h	1	0	0	2023
05040002 04 05	Switzer Creek-Clear Fork Mohican River	29.37	5	1h	1	0	2	2023
05040002 05 01	Upper Muddy Fork Mohican River	28.59	3	5	4C	0	3	2023
05040002 05 02	Middle Muddy Fork Mohican River	27.54	3	5h	1	0	1	2023
05040002 05 03	Lower Muddy Fork Mohican River	49.58	3	5h	5	0	6	2023
05040002 06 01	Lang Creek	34.13	3	5h	1	0	3	2023
05040002 06 02	Orange Creek	37.52	3	5h	1	0	3	2023
05040002 06 03	Katotawa Creek	13.53	3	5h	1	0	4	2023
05040002 06 04	Oldtown Run	23.12	3	5h	1	0	4	2023
05040002 06 05	Jerome Fork-Mohican River	35.55	3i	5	5	0	7	2023
05040002 06 06	Glenn Run-Jerome Fork Mohican River	17.86	3	5h	1	0	1	2023
05040002 07 01	Grab Run	34.18	3	5h	1	0	1	2023
05040002 07 02	Mohicanville Dam-Lake Fork Mohican River	24.53	3	5h	5	0	6	2023
05040002 07 03	Plum Run-Lake Fork Mohican River	20.9	3	5h	1	0	5	2023

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05040002 08 01	Honey Creek	17.32	3	5h	1	0	3	2023
05040002 08 02	Town of Perrysville-Black Fork Mohican River	17.76	3i	5h	4n	0	5	2023
05040002 08 03	Big Run-Black Fork Mohican River	19.26	3i	5h	4n	0	6	2023
05040002 08 04	Sigafoos Run-Mohican River	28.45	3	3	3	0	0	2023
05040002 08 05	Negro Run-Mohican River	28.64	3	5h	1	0	4	2023
05040002 08 06	Flat Run-Mohican River	27.41	3	3	3	0	0	2023
05040003 01 01	Headwaters North Branch Kokosing River	45.29	1	5h	5	0	7	2022
05040003 01 02	East Branch Kokosing River	31.58	1h	5h	1	0	4	2022
05040003 01 03	Job Run-North Branch Kokosing River	20.87	3i	1	1	0	0	2022
05040003 02 01	Headwaters Kokosing River	36.42	3	5h	5	0	7	2022
05040003 02 02	Mile Run-Kokosing River	38.6	3	5h	5	0	6	2022
05040003 02 03	Granny Creek-Kokosing River	25.6	3i	5h	1	0	3	2022
05040003 03 01	Dry Creek	33.93	3	1h	1	0	0	2022
05040003 03 02	Armstrong Run-Kokosing River	17.06	3	5	1	0	4	2022
05040003 03 03	Big Run	31.06	3	5h	1	0	3	2022
05040003 03 04	Delano Run-Kokosing River	32.95	3i	5	5	0	10	2022
05040003 03 05	Little Schenck Creek	16.26	3	5h	1	0	1	2022
05040003 03 06	Schenck Creek	24.99	3	5h	1	0	3	2022
05040003 03 07	Indianfield Run-Kokosing River	23.7	3i	5	1	0	5	2022
05040003 04 01	Little Jelloway Creek	19.55	1	5	5	0	7	2022
05040003 04 02	Jelloway Creek	54.51	3	5	5	0	6	2022
05040003 04 03	Brush Run-Kokosing River	32.29	1	1h	1	0	0	2022
05040003 05 01	Headwaters Killbuck Creek	22.18	3	5	1	0	2	2024
05040003 05 02	Little Killbuck Creek-Killbuck Creek	33.58	3	1	5	0	3	2024
05040003 05 03	Rathburn Run-Little Killbuck Creek	20.97	3	5h	1	0	4	2024
05040003 05 04	Cedar Run-Killbuck Creek	39.39	3	5h	1	0	5	2024
05040003 05 05	Clear Creek-Killbuck Creek	22.6	3	5h	1	0	5	2024
05040003 06 01	Little Apple Creek	12.83	3	5h	5	0	5	2024
05040003 06 02	Apple Creek	38.89	3	5	1	0	1	2024
05040003 06 03	Shreve Creek	15.98	3	5	5	0	4	2024

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05040003 06 04	Jennings Ditch-Killbuck Creek	41.59	3i	5h	5	0	9	2024
05040003 06 05	North Branch Salt Creek	16.45	3	5h	5	0	2	2024
05040003 06 06	Salt Creek	27.17	3	5h	1	0	4	2024
05040003 06 07	Tea Run-Killbuck Creek	18.28	3	5h	3ih	0	5	2024
05040003 07 01	Paint Creek	30.38	3	5h	1	0	1	2024
05040003 07 02	Martins Creek	22.97	3	5h	3i	0	1	2024
05040003 07 03	Honey Run-Killbuck Creek	15.91	3	5h	1	0	5	2024
05040003 07 04	Black Creek	35.24	3	5h	1	0	3	2024
05040003 07 05	Shrimplin Creek-Killbuck Creek	47.56	3	5	5	0	9	2024
05040003 08 01	Wolf Creek	26.74	3	5h	1	0	3	2024
05040003 08 02	Headwaters Doughty Creek	32.87	3	5	5	0	5	2024
05040003 08 03	Bucks Run-Doughty Creek	28.14	3	5h	1	0	3	2024
05040003 08 04	Big Run-Killbuck Creek	27.4	1	5	1	0	6	2024
05040003 08 05	Bucklew Run-Killbuck Creek	32.05	1	5h	1	0	5	2024
05040003 09 01	Mohawk Creek	25.58	3	5h	1	1	3	2025
05040003 09 02	Dutch Run-Walhonding River	15.85	3	5h	1	0	3	2025
05040003 09 03	Beaver Run	14.08	3	5h	5	0	6	2025
05040003 09 04	Simmons Run	16.47	3	5h	5	0	6	2025
05040003 09 05	Darling Run-Walhonding River	15.95	3	5h	4n	0	3	2025
05040003 09 06	Headwaters Mill Creek	26.92	3	5h	5	0	5	2025
05040003 09 07	Spoon Creek-Mill Creek	24.28	3	5h	5	0	5	2025
05040003 09 08	Crooked Creek-Walhonding River	18.33	3	5h	4n	0	1	2025
05040004 01 01	Headwaters Wakatomika Creek	32.86	5h	4Ahx	1ht	0	2	2018
05040004 01 02	Winding Fork	21.38	5h	4Ahx	4Ah	3	2	2018
05040004 01 03	Brushy Fork	27.62	5h	4Ahx	4Ah	0	2	2018
05040004 01 04	Jug Run-Wakatomika Creek	36.45	1h	4Ahx	1ht	0	0	2018
05040004 02 01	Black Run-Walatomika Creek	35.44	5h	4Ahx	4Ah	0	2	2018
05040004 02 02	Mill Fork	24.25	5h	4Ahx	4Ah	0	2	2018
05040004 02 03	Little Wakatomika Creek	37.47	5h	4Ahx	4Ah	0	2	2018
05040004 02 04	Town of Frazeysburg-Wakatomika Creek	18.91	1h	4Ahx	4Ah	0	0	2018

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05040004 03 01	Robinson Run-Muskingum River	34.16	3	1h	5	0	1	2025
05040004 03 02	Village of Adams Mills-Muskingum River	19.24	3	5h	3	0	1	2025
05040004 03 03	North Branch Symmes Creek	14.92	3	5h	1	0	3	2025
05040004 03 04	South Branch Symmes Creek-Symmes Creek	17.28	3	5h	4n	0	2	2025
05040004 03 05	Blount Run-Muskingum River	45.32	3	5h	5	0	8	2025
05040004 04 01	Valley Run	29.43	3	4Ah	4A	0	0	2023
05040004 04 02	Headwaters Jonathon Creek	28	3	4Ah	1	0	0	2023
05040004 04 03	Turkey Run	14.26	3	4Ah	1	0	0	2023
05040004 04 04	Buckeye Fork	23.3	3i	1h	5	0	4	2023
05040004 04 05	Kent Run	22.82	3	4Ah	1	3i	0	2023
05040004 04 06	Thompson Run	15.46	3	4Ah	1	0	0	2023
05040004 04 07	Painter Creek-Jonathon Creek	60.61	3i	4Ah	4C	1	0	2023
05040004 05 01	Black Fork	28.75	3	4Ah	4A	1	0	2023
05040004 05 02	Upper Moxahala Creek	39.08	3	1h	4A	0	0	2023
05040004 05 03	Middle Moxahala Creek	18.64	3	1	4A	0	0	2023
05040004 05 04	Lower Moxahala Creek	22.11	3	4Ah	4A	0	0	2023
05040004 06 01	Little Salt Creek	14.73	3	4Ah	1	0	0	2023
05040004 06 02	Headwaters Salt Creek	46.1	3	4Ah	1	0	0	2023
05040004 06 03	Buffalo Fork	27.55	3	4Ah	1	0	0	2023
05040004 06 04	Boggs Creek	18.21	3	4Ah	1	0	0	2023
05040004 06 05	Manns Fork Salt Creek	19.81	3i	4Ah	1	1	1	2023
05040004 06 06	Mouth Salt Creek	18.48	3	4Ah	1	0	0	2023
05040004 07 01	Mans Fork	28.13	3	1	1	0	0	2028
05040004 07 02	Headwaters Meigs Creek	35.79	3	1	1	0	0	2028
05040004 07 03	Dyes Fork	45.05	3	1	1	0	0	2028
05040004 07 04	Fourmile Run-Meigs Creek	33.31	3	5	1	0	4	2028
05040004 08 01	Brush Creek	24.97	3	5h	5	0	3	2028
05040004 08 02	Flat Run-Muskingum River	19.31	3i	5h	1	0	4	2028
05040004 08 03	Duncan Run-Muskingum River	21.36	3	5h	5	0	5	2028
05040004 08 04	Island Run	13.52	3	5h	4n	0	4	2028

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05040004 08 05	Blue Rock Creek-Muskingum River	23.2	3	1h	4n	0	0	2028
05040004 08 06	Oilspring Run-Muskingum River	22.01	3	1	5	0	1	2028
05040004 08 07	Bald Eagle Run	10.94	3	5	1	0	4	2028
05040004 08 08	Bell Creek-Muskingum River	25.1	3	5	1	0	4	2028
05040004 08 09	Olney Run-Muskingum River	22.19	3	5	1	0	4	2028
05040004 09 01	South West Branch Wolf Creek	22.11	3	5	1	0	3	2028
05040004 09 02	Headwaters South Branch Wolf Creek	40.73	3	5	5	0	6	2028
05040004 09 03	Plumb Run-South Branch Wolf Creek	16.75	3	5	5	0	7	2028
05040004 10 01	Headwaters West Branch Wolf Creek	55.48	3	5	4n	0	3	2028
05040004 10 02	Aldridge Run-West Branch Wolf Creek	35.07	3	5	1	0	3	2028
05040004 10 03	Coal Run	21.86	3	5	1	0	1	2028
05040004 10 04	Hayward Run-Wolf Creek	41.89	3	5	5	0	7	2028
05040004 11 01	Headwaters Olive Green Creek	30.52	3	5	1	0	4	2028
05040004 11 02	Keith Fork	15.03	3	5	1	0	4	2028
05040004 11 03	Little Olive Green Creek	18.12	3	5	1	0	4	2028
05040004 11 04	Reasoners Run-Olive Green Creek	19.41	1	5	5	0	6	2028
05040004 11 05	Congress Run-Muskingum River	21.18	3	1	5	0	1	2028
05040004 12 01	Big Run	18.24	3	1	1	0	0	2027
05040004 12 02	Rainbow Creek	18.81	3	5	1	0	2	2027
05040004 12 03	Cat Creek-Muskingum River	32.53	3	5	1	0	4	2027
05040004 12 04	Devol Run-Muskingum River	20.7	3	5	4n	0	3	2027
05040005 01 01	Headwaters Seneca Fork	29.19	3	5	1	0	1	2029
05040005 01 02	Beaver Creek	23.33	3	5	5	0	4	2029
05040005 01 03	Glady Run-Seneca Fork	41.33	3	5	5	0	4	2029
05040005 01 04	Depue Run-Seneca Fork	24.24	3i	1	3	0	0	2029
05040005 01 05	Opossum Run-Seneca Fork	32.47	3	5	5	0	4	2029
05040005 02 01	Yoker Creek	23.25	3	5	1	0	3	2029
05040005 02 02	Headwaters Collins Fork	33.92	3	5	5	0	4	2029
05040005 02 03	South Fork Buffalo Creek-Buffalo Creek	19.11	3	5	5	0	6	2029
05040005 02 04	North Fork Buffalo Creek-Buffalo Creek	30.93	3	5	5	0	5	2029

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05040005 02 05	Crane Run-Buffalo Fork	14.04	3	5	5	0	4	2029
05040005 02 06	Chapman Run	19.38	3i	5	5	0	6	2029
05040005 02 07	Trail Run-Wills Creek	22.98	1	5	5	1	7	2029
05040005 03 01	Headwaters Leatherwood Creek	35.09	3	5	5	0	7	2029
05040005 03 02	Hawkins Run-Leatherwood Creek	56.58	3	5	1	0	3	2029
05040005 04 01	Brushy Fork	19.75	3	5	1	0	3	2029
05040005 04 02	Headwaters Salt Fork	55.75	3	5	5	0	6	2029
05040005 04 03	Clear Fork	15.51	3	5	1	0	3	2029
05040005 04 04	Rocky Fork	20.34	3	5	1	0	3	2029
05040005 04 05	Salt Fork Lake-Sugartree Fork	26.37	3i	5	1	0	3	2029
05040005 04 06	Beeham Run-Salt Fork	21.83	1	1	5	0	1	2029
05040005 05 01	North Crooked Creek	17.78	3	5	1	3	5	2029
05040005 05 02	Headwaters Crooked Creek	16.01	3	5	5	0	6	2029
05040005 05 03	Peters Creek-Crooked Creek	27.74	3	5	5	0	7	2029
05040005 05 04	Sarchet Run-Wills Creek	27.2	3i	5	1	0	4	2029
05040005 05 05	Indian Camp Run	18.41	3	5	1	0	3	2029
05040005 05 06	Headwaters Birds Run	14.35	3	5	1	0	3	2029
05040005 05 07	Johnson Fork-Birds Run	16.76	3	5	5	0	5	2029
05040005 05 08	Wolf Run-Wills Creek	26.79	1	3	5	0	1	2029
05040005 06 01	Bacon Run	15.7	1h	5	5	0	4	2029
05040005 06 02	Twomile Run-Wills Creek	24.6	1	5	5	0	6	2029
05040005 06 03	White Eyes Creek	43.7	1h	5	5	0	3	2029
05040005 06 04	Wills Creek Dam-Wills Creek	27.14	1	1	3	0	0	2029
05040005 06 05	Mouth Wills Creek	11.77	1	3	3	0	0	2029
05040006 01 01	Otter Fork Licking River	28.27	3	5h	5	0	7	2023
05040006 01 02	Headwaters North Fork Licking River	32.96	3	5h	5	0	7	2023
05040006 01 03	Sycamore Creek	30.66	3	5h	1	0	3	2023
05040006 01 04	Vance Creek-North Fork Licking River	18.93	3	5h	5	0	7	2023
05040006 02 01	Lake Fork Licking River	35.11	3	5h	1	0	4	2023
05040006 02 02	Clear Fork Licking River	22.07	3	5h	1	0	2	2023

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05040006 02 03	Dog Hollow Run-North Fork Licking River	24.56	3	5	1	0	5	2023
05040006 02 04	Dry Creek	24.6	3	5h	1	0	2	2023
05040006 02 05	Log Pond Run-North Fork Licking River	22.96	3	5h	5	1	8	2023
05040006 03 01	Headwaters Raccoon Creek	27.01	3	5	5	0	4	2023
05040006 03 02	Lobdell Creek	18.98	3	5h	5	0	6	2023
05040006 03 03	Moots Run-Raccoon Creek	25.69	3	5h	1	0	4	2023
05040006 03 04	Salt Run-Raccoon Creek	30.93	3	5	1	0	3	2023
05040006 04 01	Muddy Fork	14.01	3	5h	5	0	3	2023
05040006 04 02	Headwaters South Fork Licking River	15.43	3	5h	1	0	3	2023
05040006 04 03	Buckeye Lake	27.06	1	5	5	0	8	2023
05040006 04 04	Buckeye Lake Reservoir Feeder	17.23	3	5	1	0	2	2023
05040006 04 05	Town of Kirkersville-South Fork Licking River	17.16	3	5	1	0	4	2023
05040006 04 06	Bell Run-South Fork Licking River	25.98	3	5	1	0	2	2023
05040006 04 07	Ramp Creek	16.84	3	5h	1	0	4	2023
05040006 04 08	Dutch Fork	21.76	3	5h	1	0	3	2023
05040006 04 09	Beaver Run-South Fork Licking River	29.92	3	5	1	0	6	2023
05040006 05 01	Claylick Creek	20.76	5h	5h	1	0	5	2023
05040006 05 02	Lost Run	22.98	5h	5h	1	0	3	2023
05040006 05 03	Rocky Fork	55.52	1	5	1	0	4	2023
05040006 05 04	Bowling Green Run-Licking River	24.88	3	3	4n	0	0	2023
05040006 06 01	Brushy Fork	18.32	3	5h	1	0	4	2023
05040006 06 02	Big Run	25.08	1h	5h	3i	0	3	2023
05040006 06 03	Dillon Lake-Licking River	47.07	5	5h	1	0	6	2023
05040006 06 04	Timber Run-Licking River	37.26	3	5h	5	0	7	2023
05060001 01 01	Cottonwood Ditch	19.52	3	5	1	0	4	2024
05060001 01 02	Headwaters Scioto River	76.32	3	5h	5	0	6	2024
05060001 01 03	Taylor Creek	16.85	3	5h	1	0	4	2024
05060001 01 04	Silver Creek-Scioto River	46.55	3	5h	5	0	6	2024
05060001 02 01	Headwaters Rush Creek	60.73	3	5	5	0	7	2024
05060001 02 02	McDonald Creek	14.74	3	5h	5	0	5	2024

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05060001 02 03	Dudley Run-Rush Creek	29.86	5	5h	5	0	7	2024
05060001 03 01	Rock Fork	24.01	5h	5h	5	0	7	2024
05060001 03 02	Headwaters Little Scioto River	47.52	3i	5h	5	0	6	2024
05060001 03 03	City of Marion-Little Scioto River	22.16	3i	5	5	3i	7	2024
05060001 03 04	Honey Creek-Little Scioto River	19.05	5h	5h	5	0	8	2024
05060001 04 01	Gander Run-Scioto River	17.57	1	5	1	0	6	2024
05060001 04 02	Panther Creek	23.15	5h	1h	5	0	3	2024
05060001 04 03	Wolf Creek-Scioto River	22.47	5h	5h	4n	0	6	2024
05060001 04 04	Wildcat Creek	22.43	5h	5h	5	0	4	2024
05060001 04 05	Town of La Rue-Scioto River	19.84	1	5h	1	0	6	2024
05060001 04 06	Glade Run-Scioto River	38.34	5h	5h	5	3i	12	2024
05060001 05 01	Patton Run	15.79	3	5h	5	0	4	2024
05060001 05 02	Davids Run-Scioto River	17.2	3	3	3	0	0	2024
05060001 05 03	Kebler Run	14.32	3	5h	1	0	4	2024
05060001 05 04	Fulton Creek	46.67	3	5	5	0	5	2024
05060001 05 05	Ottawa Creek-Scioto River	46.37	3	3	1	0	0	2024
05060001 06 01	Upper Mill Creek	34.85	3	5	1d	0	3	2027
05060001 06 02	Middle Mill Creek	59.91	3	5	5d	1	9	2027
05060001 06 03	Blues Creek	37.06	3	1	5d	0	1	2027
05060001 06 04	Lower Mill Creek	47.24	1	5	5d	0	6	2027
05060001 07 01	Headwaters Bokes Creek	35.69	3	5	4A	0	4	2028
05060001 07 02	Brush Run-Bokes Creek	20.27	3i	5	4A	0	4	2028
05060001 07 03	Smith Run-Bokes Creek	27.64	3i	5	4A	0	3	2028
05060001 07 04	Moors Run-Scioto River	24.84	3	5	5	0	6	2028
05060001 08 01	Headwaters Olentangy River	49.56	1h	4A	4Ah	3i	1	2018
05060001 08 02	Mud Run	20.41	5h	4Ahx	1ht	0	2	2018
05060001 08 03	Flat Run	42.17	5h	4Ahx	1ht	0	2	2018
05060001 08 04	Town of Caledonia-Olentangy River	21.72	5h	4Ahx	4Ah	0	2	2018
05060001 09 01	Shaw Creek	29.9	5h	4Ahx	1ht	0	2	2018
05060001 09 02	Headwaters Whetstone Creek	62.86	1h	4A	4Ah	0	0	2018

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05060001 09 03	Claypool Run-Whetstone Creek	21.63	1h	4Ahx	4Ah	0	0	2018
05060001 10 01	Otter Creek-Olentangy River	22.86	5h	4Ahx	4Ah	0	2	2018
05060001 10 02	Grave Creek	28.83	5h	4A	4A	0	2	2018
05060001 10 03	Beaver Run-Olentangy River	24.04	1h	4Ahx	4Ah	0	0	2018
05060001 10 04	Qu Qua Creek	16.91	5h	4Ahx	4Ah	0	2	2018
05060001 10 05	Brandige Run-Olentangy River	29.79	1h	4Ahx	4Ch	0	0	2018
05060001 10 06	Indian Run-Olentangy River	15	1h	4Ahx	1ht	0	0	2018
05060001 10 07	Delaware Run-Olentangy River	43.89	1h	4Ahx	4A	3i	1	2018
05060001 11 01	Deep Run-Olentangy River	48.91	1h	4A	4A	3i	0	2018
05060001 11 02	Rush Run-Olentangy River	30.65	1h	4A	1ht	0	0	2018
05060001 11 03	Mouth Olentangy River	32	1h	4Ahx	4A	0	0	2018
05060001 12 01	Eversole Run	13.66	3i	5h	1	0	4	2025
05060001 12 02	O'Shaughnessy Dam-Scioto River	16.72	1	5h	3	0	4	2025
05060001 12 03	Indian Run	17.32	3	5h	5	0	4	2025
05060001 12 04	Hayden Run-Scioto River	47.72	1	5h	5	0	5	2025
05060001 12 05	Dry Run-Scioto River	24.64	3	5h	5	0	2	2025
05060001 13 01	Culver Creek	13.22	3	4Ahx	4Ah	0	0	2020
05060001 13 02	Headwaters Big Walnut Creek	55.33	3	4Ahx	4Ah	0	0	2020
05060001 13 03	Rattlesnake Creek	22.08	3	4Ahx	4Ah	0	0	2020
05060001 13 04	Perfect Creek-Big Walnut Creek	10.1	3	4Ahx	1ht	0	0	2020
05060001 13 05	Little Walnut Creek	32.83	3	4Ahx	4Ah	0	0	2020
05060001 13 06	Prairie Run-Big Walnut Creek	8.38	3	4A	4Ah	0	0	2020
05060001 13 07	Duncan Run	16.79	3	4Ahx	4Ah	0	0	2020
05060001 13 08	Hoover Reservoir-Big Walnut Creek	30.17	1	1d	3t	1	1	2020
05060001 14 01	West Branch Alum Creek	29.47	1h	4A	4Ah	0	0	2020
05060001 14 02	Headwaters Alum Creek	35.55	1h	4Ahx	4Ah	0	0	2020
05060001 14 03	Big Run-Alum Creek	37.17	1h	1d	4Ah	1	0	2020
05060001 14 04	Alum Creek Dam-Alum Creek	20.27	1	1d	3t	1	1	2020
05060001 15 01	Rocky Fork Creek	30.39	3	4Ahx	5	0	1	2020
05060001 15 02	City of Gahanna-Big Walnut Creek	15.91	3	4Ahx	4Ah	1	0	2020

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05060001 15 03	Headwaters Blacklick Creek	48.88	3	4Ahx	4Ah	0	0	2020
05060001 15 04	Town of Brice-Blacklick Creek	15.06	3	4A	5d	0	2	2020
05060001 15 05	Mason Run-Big Walnut Cr.	35.64	3	4Ahx	4Ah	0	0	2020
05060001 16 01	Westerville Reservoir-Alum Creek	24.71	3	1d	4Ah	3	0	2020
05060001 16 02	Bliss Run-Alum Creek	52.92	3	4A	4A	0	0	2020
05060001 16 03	Town of Lockbourne-Alum Creek	22.77	3	4Ahx	1ht	0	0	2020
05060001 17 01	Pawpaw Creek	17.34	5h	4Ah	4A	0	2	2020
05060001 17 02	Headwaters Walnut Creek	42.62	1h	4A	4A	0	0	2020
05060001 17 03	Poplar Creek	17.43	5h	4Ah	4n	0	2	2020
05060001 17 04	Sycamore Creek	23.59	5h	4A	4A	0	2	2020
05060001 17 05	Town of Carroll-Walnut Creek	37.12	1	4A	1t	0	0	2020
05060001 18 01	Georges Creek	14.25	5h	4Ah	4A	0	2	2020
05060001 18 02	Tussing Ditch-Walnut Creek	22.93	5h	5	1t	0	6	2020
05060001 18 03	Turkey Run	14.6	5h	4Ah	4A	0	2	2020
05060001 18 04	Little Walnut Creek	30.09	5h	5h	1t	0	6	2020
05060001 18 05	Big Run-Walnut Creek	51.59	1	5h	4A	0	4	2020
05060001 18 06	Mud Run-Walnut Creek	13.7	5h	5	1t	0	4	2020
05060001 19 01	Headwaters Big Darby Creek	19.2	5h	4A	1d	0	2	2029
05060001 19 02	Spain Creek-Big Darby Creek	63.62	1	4A	4A	0	0	2029
05060001 19 03	Buck Run	29.88	5h	4A	1d	0	2	2029
05060001 19 04	Sugar Run	20.48	5h	4A	4A	0	2	2029
05060001 19 05	Robinson Run-Big Darby Creek	43.86	1	4A	1d	0	0	2029
05060001 20 01	Headwaters Treacle Creek	19.46	5h	4A	1d	0	2	2029
05060001 20 02	Proctor Run-Treacle Creek	17.43	5h	4A	4A	0	2	2029
05060001 20 03	Headwaters Little Darby Creek	29.84	5h	4A	4A	0	2	2029
05060001 20 04	Spring Fork	37.96	5h	4A	4A	0	2	2029
05060001 20 05	Barron Creek-Little Darby Creek	37.4	1	4A	4A	0	0	2029
05060001 20 06	Thomas Ditch-Little Darby Creek	36.2	1	4A	1d	0	0	2029
05060001 21 01	Worthington Ditch-Big Darby Creek	58.86	1	5	1d	0	3	2029
05060001 21 02	Silver Ditch-Big Darby Creek	17.2	1	5	1	0	4	2029

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05060001 22 01	Hellbranch Run	38.27	1h	5	4A	0	3	2029
05060001 22 02	Gay Run-Big Darby Creek	25.29	5h	5	4n	0	6	2029
05060001 22 03	Greenbrier Creek-Big Darby Creek	36.19	5	5	1d	0	6	2029
05060001 22 04	Lizard Run-Big Darby Creek	24.59	5	5	1d	0	6	2029
05060001 23 01	Scioto Big Run	24.64	3	5h	5	0	2	2025
05060001 23 02	Kian Run-Scioto River	29.5	3	5h	5	0	2	2025
05060001 23 03	Grant Run-Scioto River	43.58	3	5h	5	0	4	2025
05060001 23 04	Grove Run-Scioto River	57.15	5h	5	1	0	6	2025
05060001 23 05	Dry Run	18.81	3	5h	5	0	7	2025
05060001 23 06	Town of Circleville-Scioto River	13.69	3	3	3	0	0	2025
05060002 01 01	Headwaters Deer Creek	17.13	3	5	1	0	3	2026
05060002 01 02	Richmond Ditch-Deer Creek	32.64	1	5	4C	0	3	2026
05060002 01 03	Glade Run	20.6	3	5	5	0	6	2026
05060002 01 04	Walnut Run	15.26	3	5	5	0	6	2026
05060002 01 05	Oak Run	26.77	3	5	1	0	4	2026
05060002 01 06	Turkey Run-Deer Creek	32.54	1	5	1	0	4	2026
05060002 02 01	South Fork Bradford Creek-Bradford Creek	30.04	3	5	1	0	1	2026
05060002 02 02	Sugar Run	23.02	3	5	5	0	4	2026
05060002 02 03	Opossum Run	19.5	3	5	1	0	3	2026
05060002 02 04	Town of Mount Sterling-Deer Creek	31.42	1	5	1	0	4	2026
05060002 02 05	Deer Creek Lake-Deer Creek	27.7	5	5	5	0	7	2026
05060002 02 06	Buskirk Creek	18.67	3	5	5	0	4	2026
05060002 02 07	Dear Creek Dam-Deer Creek	14.5	3i	5	4C	0	2	2026
05060002 03 01	Dry Run	20.8	3	5	3i	0	3	2026
05060002 03 02	Hay Run	29.1	3	5	4n	0	3	2026
05060002 03 03	Waugh Creek	20.43	3	5	1	0	1	2026
05060002 03 04	State Run-Deer Creek	31.25	3i	5	1	0	4	2026
05060002 04 01	Hargus Creek	19.78	5h	5	1	0	6	2026
05060002 04 02	Yellowbud Creek	36.58	5h	5	5	0	9	2026
05060002 04 03	Lick Run-Scioto River	30.3	3	5	1	0	2	2026

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05060002 04 04	Congo Creek	16.69	5h	5	1	0	5	2026
05060002 04 05	Scippo Creek	35.1	5	5	5	0	8	2026
05060002 04 06	Blackwater Creek-Scioto River	23.94	3	5	5	0	3	2026
05060002 05 01	Kinnikinnick Creek	36.22	3	5	5	0	7	2026
05060002 05 02	Dry Run-Scioto River	33.94	3	5	3i	0	3	2026
05060002 05 03	Lick Run-Scioto River	26.95	3i	5	3i	0	4	2026
05060002 06 01	Beech Fork	19.93	5h	5h	4A	0	6	2021
05060002 06 02	Headwaters Salt Creek	27.86	5h	5h	4A	0	6	2021
05060002 06 03	Laurel Run	54.57	5h	5h	4A	0	5	2021
05060002 06 04	Pine Creek	40.46	5h	5h	4A	0	6	2021
05060002 06 05	Blue Creek-Salt Creek	31.99	1	5h	1	0	2	2021
05060002 07 01	Pigeon Creek	46.23	3	5h	5	0	6	2021
05060002 07 02	Middle Fork Salt Creek	62.73	3	5h	4A	0	4	2021
05060002 08 01	Headwaters Little Salt Creek	33.69	3i	5h	4A	0	2	2021
05060002 08 02	Buckeye Creek	19.07	3i	1h	4A	1	0	2021
05060002 08 03	Horse Creek-Little Salt Creek	23.03	3i	5	4A	1	4	2021
05060002 08 04	Pigeon Creek	30.16	3	5h	4A	0	2	2021
05060002 08 05	Sour Run-Little Salt Creek	32.59	5	1h	1t	0	2	2021
05060002 09 01	East Fork Queer Creek	13.85	5h	5h	1	0	4	2021
05060002 09 02	Queer Creek	21.2	5h	5h	4n	1	6	2021
05060002 09 03	Pretty Run	17.59	5h	1h	1	0	2	2021
05060002 09 04	Pike Run	23.42	5h	5h	5	0	8	2021
05060002 09 05	Village of Eagle Mills-Salt Creek	16.91	5h	5h	1	0	4	2021
05060002 09 06	Poe Run-Salt Creek	39.2	5	5h	1	0	6	2021
05060002 10 01	Indian Creek	23.36	5h	5	1	0	4	2026
05060002 10 02	Dry Run	17.25	5h	5	4n	0	3	2026
05060002 10 03	Headwaters Walnut Creek	35.71	5h	5	1	0	6	2026
05060002 10 04	Lick Run-Walnut Creek	23.49	5h	5	1	0	6	2026
05060002 10 05	Stony Creek-Scioto River	31.1	1	1	4n	0	0	2026
05060002 11 01	Carrs Run	13.74	3	5	5	0	5	2026

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05060002 11 02	Left Fork Crooked Creek	17.75	3	5	4n	0	4	2026
05060002 11 03	Crooked Creek	25.08	3	5	1	0	4	2026
05060002 11 04	Pee Pee Creek	36.24	5	1	4n	0	2	2026
05060002 11 05	Meadow Run-Scioto River	44.15	3	5	1	0	2	2026
05060002 12 01	Headwaters Sunfish Creek	36.02	3	5	1	0	4	2026
05060002 12 02	Headwaters Morgan Fork	21.03	1	1	4C	0	0	2026
05060002 12 03	Left Fork Morgan Fork-Morgan Fork	13.5	3	1	1	0	0	2026
05060002 12 04	Grassy Fork-Sunfish Creek	18.39	3	5	1	0	4	2026
05060002 12 05	Chenoweth Fork	29.85	3	5	1	0	4	2026
05060002 12 06	Leeth Creek-Sunfish Creek	25.66	5	5	1	0	5	2026
05060002 13 01	No Name Creek	16.19	3	1	1	0	0	2026
05060002 13 02	Headwaters Big Beaver Creek	39.93	3	5	1	0	3	2026
05060002 13 03	Little Beaver Creek-Big Beaver Creek	30.34	1	5	5	0	8	2026
05060002 13 04	Boswell Run-Scioto River	18.35	3	1	3	0	0	2026
05060002 14 01	Churn Creek	17.87	3	4Ah	5	0	4	2021
05060002 14 02	Mill Creek	17.23	3	4Ah	5	0	2	2021
05060002 14 03	Turkey Creek	16.91	3	4Ah	4n	0	0	2021
05060002 14 04	Turkey Run-South Fork Scioto Brush Creek	21.3	3	4Ah	4n	0	0	2021
05060002 14 05	Rocky Fork	22.91	3	4Ah	4n	0	0	2021
05060002 14 06	Beech Fork-South Fork Scioto Brush Creek	16.77	3	1h	5	0	1	2021
05060002 15 01	Headwaters Scioto Brush Creek	30.4	3	4Ah	5	0	4	2021
05060002 15 02	Rarden Creek	18.72	3	4Ah	4A	0	0	2021
05060002 15 03	Jaybird Branch-Scioto Brush Creek	16.45	3	4Ah	4A	0	0	2021
05060002 15 04	Dunlap Creek-Scioto Brush Creek	28.75	3	4Ah	5	0	3	2021
05060002 15 05	Bear Creek	19.17	3	4Ah	5	0	3	2021
05060002 15 06	McCullough Creek	19.82	3	4Ah	4n	0	0	2021
05060002 15 07	Duck Run-Scioto Brush Creek	26.85	3	4Ah	5	0	4	2021
05060002 16 01	Camp Creek	32.03	3	5	1	0	4	2026
05060002 16 02	Big Run-Scioto River	38.36	5	1	5	0	6	2026
05060002 16 03	Bear Creek-Scioto River	46.78	3	5	5	0	7	2026

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05060002 16 04	Pond Creek	26.05	3	5	4n	0	4	2026
05060002 16 05	Carroll Run-Scioto River	16.05	3	3	3	0	0	2026
05060003 01 01	Headwaters Paint Creek	40.51	5h	4Ah	3i	0	2	2022
05060003 01 02	East Fork Paint Creek	51.9	5h	4A	4A	0	2	2022
05060003 01 03	Town of Washington Court House-Paint Creek	27.22	1	4A	4A	3i	0	2022
05060003 02 01	Headwaters Sugar Creek	44.2	3	4A	4A	0	0	2022
05060003 02 02	Camp Run-Sugar Creek	37.32	3	4Ah	4A	0	0	2022
05060003 03 01	Wilson Creek	21.48	3	4Ah	5	0	1	2022
05060003 03 02	Grassy Branch	13.13	3	1h	4A	0	0	2022
05060003 03 03	West Branch Rattlesnake Creek	24.78	3	4Ah	4A	0	0	2022
05060003 03 04	Headwaters Rattlesnake Creek	45.08	3	1d	4A	0	0	2022
05060003 03 05	Waddle Ditch-Rattlesnake Creek	25.24	3	4Ah	4A	0	0	2022
05060003 04 01	South Fork Lees Creek	19.97	3	4Ah	4A	0	0	2022
05060003 04 02	Middle Fork Lees Creek	17.2	3	1h	1	0	0	2022
05060003 04 03	Lees Creek	39.66	3	4A	4A	0	0	2022
05060003 04 04	Walnut Creek	14.86	3	4Ah	1	0	0	2022
05060003 04 05	Hardin Creek	21.28	3	1h	1	0	0	2022
05060003 04 06	Fall Creek	15.12	3	1h	5	0	3	2022
05060003 04 07	Big Branch-Rattlesnake Creek	20.48	3i	4Ah	1	0	0	2022
05060003 05 01	South Fork Rocky Fork	10.36	1h	3	1	0	0	2022
05060003 05 02	Clear Creek	45.29	1h	4A	5	3i	4	2022
05060003 05 03	Headwaters Rocky Fork	33.32	1h	1d	1	0	0	2022
05060003 05 04	Rocky Fork Lake-Rocky Fork	24.78	1h	3	3	0	0	2022
05060003 05 05	Franklin Branch-Rocky Fork	30.58	1h	4Ah	4A	0	0	2022
05060003 06 01	Indian Creek-Paint Creek	46.16	5h	4Ah	4A	0	2	2022
05060003 06 02	Farmers Run-Paint Creek	31.06	5h	4A	4A	0	2	2022
05060003 06 03	Cliff Creek-Paint Creek	17.53	1	3	3	0	0	2022
05060003 07 01	Buckskin Creek	39.88	3	4Ah	4A	0	0	2022
05060003 07 02	Upper Twin Creek	14.3	3	4Ah	1	0	0	2022
05060003 07 03	Lower Twin Creek	16.6	3	4Ah	3i	0	0	2022

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05060003 07 04	Sulphur Lick-Paint Creek	51.32	3	4Ah	4A	0	0	2022
05060003 08 01	Thompson Creek	10.41	3	4Ah	1	0	0	2022
05060003 08 02	Headwaters North Fork Paint Creek	15.57	3	1h	1	0	0	2022
05060003 08 03	Headwaters Compton Creek	31.28	3	4Ah	1	0	0	2022
05060003 08 04	Mills Branch-Compton Creek	28.79	3	4Ah	1	0	0	2022
05060003 08 05	Mud Run-North Fork Paint Creek	34.48	1	4Ah	1	0	0	2022
05060003 09 01	Herrod Creek	15.49	3	3	3	0	0	2022
05060003 09 02	Little Creek	23.25	3	4Ah	1	0	0	2022
05060003 09 03	Oldtown Run-North Fork Paint Creek	43.98	3	4A	4A	0	0	2022
05060003 09 04	Biers Run-North Fork Paint Creek	31.32	3i	4Ah	1	0	0	2022
05060003 10 01	Black Run	9.82	3	1h	1	0	0	2022
05060003 10 02	Ralston Run	13.78	3	4Ah	4A	0	0	2022
05060003 10 03	City of Chillicothe-Paint Creek	42.51	3	4Ah	1	0	0	2022
05080001 01 01	North Fork Great Miami River	21.7	1h	4Ah	1	0	0	2023
05080001 01 02	South Fork Great Miami River	51.35	1h	4Ah	1	0	0	2023
05080001 01 03	Indian Lake-Great Miami River	27.38	1	3	4A	0	0	2023
05080001 02 01	Willow Creek	14.31	3	1h	4A	0	0	2023
05080001 02 02	Headwaters Muchnippi Creek	20.78	3	4A	1	0	0	2023
05080001 02 03	Little Muchnippi Creek	35.81	3	4A	4A	0	0	2023
05080001 02 04	Calico Creek-Muchnippi Creek	18.21	3	1h	4A	0	0	2023
05080001 03 01	Cherokee Mans Run	17.71	5h	3	1	0	2	2023
05080001 03 02	Rennick Creek-Great Miami River	28.94	5h	4A	4A	0	2	2023
05080001 03 03	Rum Creek	28.55	5h	4Ah	4A	0	2	2023
05080001 03 04	Blue Jacket Creek	13.1	5h	4A	1	0	2	2023
05080001 03 05	Bokengehalas Creek	27.74	5h	4Ah	4A	0	2	2023
05080001 03 06	Brandywine Creek-Great Miami River	33.3	5h	4Ah	4A	0	2	2023
05080001 04 01	McKees Creek	17.86	5h	4Ah	1	0	2	2023
05080001 04 02	Lee Creek	22.68	5h	4Ah	1	0	2	2023
05080001 04 03	Stoney Creek	22.26	1	4Ah	1	0	0	2023
05080001 04 04	Indian Creek	15.96	5h	4Ah	3i	0	2	2023

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05080001 04 05	Plum Creek	28.62	5h	4Ah	1	0	2	2023
05080001 04 06	Turkeyfoot Creek-Great Miami River	37.46	5h	5	4A	0	8	2023
05080001 05 01	Headwaters Loramie Creek	43.11	3	4A	5	0	1	2023
05080001 05 02	Mile Creek	62.72	3	4Ah	4A	0	0	2023
05080001 05 03	Lake Loramie-Loramie Creek	41.16	1	4A	5	0	4	2023
05080001 06 01	Nine Mile Creek	26.14	3	4Ah	1	0	0	2023
05080001 06 02	Painter Creek-Loramie Creek	27.14	3	4Ah	4A	0	0	2023
05080001 06 03	Turtle Creek	35.84	3	1h	4A	0	0	2023
05080001 06 04	Mill Creek-Loramie Creek	27.77	3	4Ah	1	0	0	2023
05080001 07 01	Leatherwood Creek	16.94	3	5h	1	0	4	2024
05080001 07 02	Mosquito Creek	38.3	1	5h	4C	3i	4	2024
05080001 07 03	Brush Creek-Great Miami River	30.19	3	5h	3i	0	4	2024
05080001 07 04	Rush Creek	18.78	3	5h	4n	0	3	2024
05080001 07 05	Garbry Creek-Great Miami River	43.83	1	3	3	5	5	2024
05080001 08 01	Spring Creek	25.47	3	1h	1	0	0	2024
05080001 08 02	Headwaters Lost Creek	14.1	3	5h	1	0	4	2024
05080001 08 03	East Branch Lost Creek	14.35	3	1h	1	0	0	2024
05080001 08 04	Little Lost Creek-Lost Creek	31.74	3	1h	1	0	0	2024
05080001 08 05	Peter's Creek-Great Miami River	52.45	3	1h	1	0	0	2024
05080001 09 01	South Fork Stillwater River	13.93	1h	5	4A	0	3	2028
05080001 09 02	Headwaters Stillwater River	14.33	1h	3	4A	0	0	2028
05080001 09 03	North Fork Stillwater River	18.92	1h	5	4A	0	1	2028
05080001 09 04	Boyd Creek	14.09	1h	5	1d	0	1	2028
05080001 09 05	Woodington Run-Stillwater River	33.86	1h	5	1d	0	3	2028
05080001 09 06	Town of Beamsville-Stillwater River	19.62	1h	5	4A	0	4	2028
05080001 10 01	Dismal Creek	19.23	3i	5	4C	0	3	2028
05080001 10 02	Kraut Creek	22.54	3	5	1d	0	3	2028
05080001 10 03	West Branch Greenville Creek	25.82	3	5	1d	0	4	2028
05080001 10 04	Headwaters Greenville Creek	34.62	1	5	4n	0	3	2028
05080001 11 01	Mud Creek	29.97	3	5	5d	3	7	2028

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05080001 11 02	Bridge Creek-Greenville Creek	20.27	1	5	4n	3	3	2028
05080001 11 03	Dividing Branch-Greenville Creek	47.82	5	5	1d	0	6	2028
05080001 12 01	Indian Creek	19.92	1h	5	4A	0	3	2028
05080001 12 02	Swamp Creek	43.32	1h	5	4A	0	4	2028
05080001 12 03	Trotters Creek	18.8	1h	5	4A	0	3	2028
05080001 12 04	Harris Creek	17.91	1h	5	4A	0	1	2028
05080001 12 05	Town of Covington-Stillwater River	21.66	1	5	4A	0	4	2028
05080001 13 01	Little Painter Creek	12.28	3	5	1d	0	1	2028
05080001 13 02	Painter Creek	35.06	3	5	4n	0	1	2028
05080001 13 03	Canyon Run-Stillwater River	44.99	3	5	3it	0	4	2028
05080001 14 01	Brush Creek	23.07	3	5	4A	0	1	2028
05080001 14 02	Ludlow Creek	41.23	3i	5	4n	0	2	2028
05080001 14 03	Brush Creek	16.41	3	5	1d	0	4	2028
05080001 14 04	Jones Run-Stillwater River	17.15	3	5	1d	0	3	2028
05080001 14 05	Mill Creek-Stillwater River	23.65	3	5	4n	0	2	2028
05080001 14 06	Town of Irvington-Stillwater River	26.23	3	5h	3it	0	4	2028
05080001 15 01	Machochee Creek	18.95	5h	3	1	0	2	2018
05080001 15 02	Headwaters Mad River	36.74	5h	3	1ht	0	2	2018
05080001 15 03	Kings Creek	44.06	5h	3	4Ah	0	2	2018
05080001 15 04	Glady Creek-Mad River	34.79	5h	5	4Ah	0	6	2018
05080001 16 01	Muddy Creek	22.8	5h	3	4Ah	0	2	2018
05080001 16 02	Dugan Run	23.48	5h	3	4Ah	0	2	2018
05080001 16 03	Nettle Creek	27.88	5h	5	4Ah	0	5	2018
05080001 16 04	Anderson Creek	18.44	5h	3	1ht	0	2	2018
05080001 16 05	Storms Creek	9.17	5h	3	1ht	0	2	2018
05080001 16 06	Chapman Creek	24.26	5h	3	5	0	4	2018
05080001 16 07	Bogles Run-Mad River	27.34	5h	5	4Ah	0	6	2018
05080001 17 01	East Fork Buck Creek	28.75	3	3	1ht	0	0	2018
05080001 17 02	Headwaters Buck Creek	30.53	3	3	1ht	0	0	2018
05080001 17 03	Sinking Creek	13.14	3i	3	1ht	0	0	2018

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05080001 17 04	Beaver Creek	25.77	3	3	1ht	0	0	2018
05080001 17 05	Clarence J Brown Lake-Buck Creek	24.11	1	3	4Ah	0	0	2018
05080001 17 06	City of Springfield-Buck Creek	18.27	3	3	1ht	0	0	2018
05080001 18 01	Moore Run	18.42	5h	3	4Ah	0	2	2018
05080001 18 02	Pondy Creek-Mad River	16.74	5h	5h	4nh	0	7	2018
05080001 18 03	Mill Creek	16.03	5h	3	1ht	0	2	2018
05080001 18 04	Donnels Creek	26.13	5h	3	4nh	0	2	2018
05080001 18 05	Rock Run-Mad River	20.99	5h	5	4Ah	0	6	2018
05080001 18 06	Jackson Creek-Mad River	30.64	5h	3	1ht	0	2	2018
05080001 19 01	Mud Creek	22.6	5h	3	4Ah	0	2	2018
05080001 19 02	Mud Run	26.17	5h	3	4Ah	0	2	2018
05080001 19 03	Huffman Dam-Mad River	28.59	3	5h	3iht	0	4	2018
05080001 19 04	City of Dayton-Mad River	22.58	3	3	4Ah	0	0	2018
05080001 20 01	East Fork Honey Creek	13	3	5h	1	0	4	2024
05080001 20 02	West Fork Honey Creek	20.91	3	5h	1	0	4	2024
05080001 20 03	Indian Creek	25.85	3	5h	1	0	4	2024
05080001 20 04	Pleasant Run-Honey Creek	30.4	3	5	5	0	8	2024
05080001 20 05	Poplar Creek-Great Miami River	54.46	5h	5h	3	0	5	2024
05080002 01 01	North Branch Wolf Creek	23.75	5h	5h	1	0	5	2025
05080002 01 02	Headwaters Wolf Creek	23.05	5h	5	5	0	6	2025
05080002 01 03	Dry Run-Wolf Creek	23.68	1	5h	1	0	4	2025
05080002 01 04	Holes Creek	27.13	5h	5h	5	0	8	2025
05080002 01 05	Town of Oakwood-Great Miami River	26.47	3	3	3	0	0	2025
05080002 01 06	Opossum Creek-Great Miami River	19.01	3	1h	1	0	0	2025
05080002 02 01	Millers Fork	24.56	5h	5h	4A	0	5	2019
05080002 02 02	Headwaters Twin Creek	44.2	5h	5h	4A	0	5	2019
05080002 02 03	Swamp Creek	17.52	5h	4Ah	5	0	5	2019
05080002 02 04	Price Creek	29.23	5h	4A	4A	0	2	2019
05080002 02 05	Lesley Run-Twin Creek	41.61	1h	4A	4A	0	0	2019
05080002 03 01	Bantas Fork	34.82	5h	1t	5	0	5	2019

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05080002 03 02	Aukerman Creek	20.85	5h	3	1	0	2	2019
05080002 03 03	Toms Run	25.73	5h	1h	4A	0	2	2019
05080002 03 04	Town of Gratis-Twin Creek	33.01	1h	5	1	0	3	2019
05080002 03 05	Little Twin Creek	22.71	5h	5	4n	0	5	2019
05080002 03 06	Town of Germantown-Twin Creek	22.34	1h	1h	1	0	0	2019
05080002 04 01	Headwaters Bear Creek	32.37	3	5h	1	0	3	2025
05080002 04 02	Mouth Bear Creek	21.14	3	1h	1	0	0	2025
05080002 04 03	Clear Creek	53.01	3	5	1	0	4	2025
05080002 04 04	Dry Run-Great Miami River	32.47	3	3	3	0	0	2025
05080002 05 01	Headwaters Sevenmile Creek	42.14	1h	3	1h	0	0	2020
05080002 05 02	Paint Creek	22.79	1h	5	1h	0	2	2020
05080002 05 03	Beasley Run-Sevenmile Creek	27.92	1h	5	1h	0	2	2020
05080002 05 04	Rush Run-Sevenmile Creek	27.25	1	3	1h	0	0	2020
05080002 05 05	Ninemile Creek-Sevenmile Creek	17	1	3	1h	0	0	2020
05080002 06 01	Headwaters Four Mile Creek	38.31	1h	1h	1	0	0	2020
05080002 06 02	Little Four Mile Creek	30.65	1h	5h	5	0	7	2020
05080002 06 03	East Fork Four Mile Creek-Four Mile Creek	16.46	1h	1h	1	0	0	2020
05080002 06 04	Acton Lake Dam-Four Mile Creek	41.37	1h	5	5	0	8	2020
05080002 06 05	Cotton Run-Four Mile Creek	51.33	1	5	5	0	5	2020
05080002 07 01	Elk Creek	47.62	5h	1h	4n	0	2	2025
05080002 07 02	Browns Run-Great Miami River	32.02	3	1h	1	0	0	2025
05080002 07 03	Shaker Creek	21.44	5h	3	5h	0	3	2025
05080002 07 04	Dicks Creek	27.71	5h	5h	5	0	10	2025
05080002 07 05	Gregory Creek	29.69	5h	1h	1	0	2	2025
05080002 07 06	Town of New Miami-Great Miami River	30.68	3i	3	3	0	0	2025
05080002 08 02	Brandywine Creek-Indian Creek	18.32	3	3	3	0	0	2019
05080002 08 03	Beals Run-Indian Creek	73.96	5	5	4n	0	6	2019
05080002 09 01	Pleasant Run	15.1	5h	5h	5	0	9	2025
05080002 09 02	Banklick Creek-Great Miami River	44.08	3i	5	5h	0	5	2025
05080002 09 03	Paddys Run	16.3	5h	3	4nh	0	2	2025

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05080002 09 04	Dry Run-Great Miami River	28.84	3	3	5h	0	3	2025
05080002 09 05	Taylor Creek	26.66	5h	5h	5	0	6	2025
05080002 09 06	Jordan Creek-Great Miami River	22.74	3	3	3	0	0	2025
05080002 09 07	Doublelick Run-Great Miami River	15.73	3	3	3	0	0	2025
05080003 07 01	Headwaters Middle Fork East Fork Whitewater River	29.12	3	3	3x	0	0	2017
05080003 07 02	Headwaters East Fork Whitewater River	33.04	3	5	3x	0	4	2017
05080003 07 03	Mud Creek-Middle Fork East Fork Whitewater River	19.55	3	3	3x	0	0	2017
05080003 07 04	Rocky Fork-East Fork Whitewater River	15.34	3	5	3x	0	4	2017
05080003 07 07	Short Creek-East Fork Whitewater River	16.83	3	3	3x	0	0	2017
05080003 07 08	Elkhorn Creek	29.21	3	3	3x	0	0	2017
05080003 08 07	Headwaters Dry Fork Whitewater River	16.27	3	3	1hx	0	0	2017
05080003 08 08	Howard Creek-Dry Fork Whitewater River	42.63	3	3	4n	0	0	2017
05080003 08 09	Lee Creek-Dry Fork Whitewater River	22.67	3	3	1hx	0	0	2017
05080003 08 10	Jameson Creek-Whitewater River	29.08	3	5	1hx	0	2	2017
05090101 01 01	Chickamauga Creek	30.95	3	3	3x	0	0	2016
05090101 01 03	Long Run-Ohio River	25.97	3	3	3x	0	0	2016
05090101 02 01	East Branch Raccoon Creek	20.12	3	3	1	0	0	2016
05090101 02 02	West Branch Raccoon Creek	22.72	3	3	5	0	1	2016
05090101 02 03	Brushy Fork	33.67	3	3	5hx	0	3	2016
05090101 02 04	Twomile Run-Raccoon Creek	16.31	3	3	5	0	4	2016
05090101 02 05	Town of Zaleski-Raccoon Creek	42.94	1h	3	5	0	4	2016
05090101 03 01	Hewett Fork	40.57	3	3	5	0	4	2016
05090101 03 02	Headwaters Elk Fork	43.8	3	3	5	0	3	2016
05090101 03 03	Flat Run-Elk Fork	16.2	3	3	5	0	1	2016
05090101 03 04	Flat Run-Raccoon Creek	54.55	3	5	5hx	0	9	2016
05090101 04 01	Headwaters Little Raccoon Creek	59.96	1h	5	5	3	5	2016
05090101 04 02	Dickason Run	27.22	3	3	5hx	0	1	2016
05090101 04 03	Meadow Run-Little Raccoon Creek	39.36	3	1	5	0	3	2016
05090101 04 04	Deer Creek-Little Raccoon Creek	28.29	3	3	5hx	0	1	2016
05090101 05 01	Pierce Run	12.7	3	3	5	0	1	2016

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05090101 05 02	Strongs Run	17.35	3	3	5hx	0	3	2016
05090101 05 03	Flatlick Run-Raccoon Creek	43.17	3	3	5hx	0	3	2016
05090101 05 04	Robinson Run-Raccoon Creek	21.74	3	3	5hx	0	3	2016
05090101 06 01	Indian Creek	21.83	3	3	5hx	0	3	2016
05090101 06 02	Barren Creek-Raccoon Creek	22.12	3	3	5hx	0	3	2016
05090101 06 03	Mud Creek-Raccoon Creek	38.8	3	3	5hx	0	3	2016
05090101 06 04	Bullskin Creek	14.44	3	3	5hx	0	3	2016
05090101 06 05	Claylick Run-Raccoon Creek	43.59	3	5h	5hx	0	7	2016
05090101 07 03	Swan Creek	16.75	3	3	3x	0	0	2016
05090101 07 04	Flatfoot Creek-Ohio River	22.59	3	3	3x	0	0	2016
05090101 07 06	Little Indian Guyan Creek	14.94	3	3	3x	0	0	2016
05090101 07 07	Johns Creek-Indian Guyan Creek	33.77	3	3	3x	0	0	2016
05090101 07 08	Wolf Creek-Indian Guyan Creek	28.46	3	3	3x	0	0	2016
05090101 07 09	Paddy Creek-Ohio River	70.23	3	3	3x	0	0	2016
05090101 08 01	Dirtyface Creek	13.46	3	3	3x	0	0	2016
05090101 08 02	Black Fork	49.38	3	5	3x	0	3	2016
05090101 08 03	Headwaters Symmes Creek	56.44	3	3	3x	0	0	2016
05090101 09 01	Sand Fork	42.42	3	1h	3x	0	0	2016
05090101 09 02	Buffalo Creek	17.56	3	3	3x	0	0	2016
05090101 09 03	Camp Creek-Symmes Creek	40.24	1	3	3x	0	0	2016
05090101 10 01	Johns Creek	22.68	3	3	3x	0	0	2016
05090101 10 02	Long Creek	15.56	3	3	3x	0	0	2016
05090101 10 03	Pigeon Creek-Symmes Creek	18.51	1	3	3x	0	0	2016
05090101 10 04	Aaron Creek-Symmes Creek	58.34	1	3	3x	0	0	2016
05090101 10 05	McKinney Creek-Symmes Creek	22.08	3	3	3x	0	0	2016
05090101 10 07	Buffalo Creek-Ohio River	19.44	3	3	3x	0	0	2016
05090103 01 01	Solida Creek-Ohio River	34.25	3	5h	5	0	4	2025
05090103 01 03	Ice Creek	39.05	5	5h	5	0	9	2025
05090103 01 04	Storms Creek	37.2	5	1h	5	0	6	2025
05090103 01 05	Pond Run-Ohio River	44.01	3	1h	3i	0	0	2025

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05090103 01 06	Ginat Creek	13.57	3	5h	5	0	4	2025
05090103 01 07	Grays Branch-Ohio River	33.89	3	5h	3i	0	4	2025
05090103 02 01	Hales Creek	32.3	5h	5h	1	0	6	2025
05090103 02 02	Headwaters Pine Creek	33.34	5h	1h	5	0	6	2025
05090103 02 03	Little Pine Creek	29.52	5h	5h	5	0	8	2025
05090103 02 04	Howard Run-Pine Creek	38.7	1	5h	1	0	4	2025
05090103 02 05	Lick Run-Pine Creek	50.28	1	1	5	0	3	2025
05090103 05 01	Headwaters Little Scioto River	20.21	3	5h	1	0	3	2025
05090103 05 02	Sugarcamp Creek	14.42	3	5h	1	0	1	2025
05090103 05 03	Holland Fork	34.74	3	1h	1	0	0	2025
05090103 05 04	McDowell Creek-Little Scioto River	38.41	1	5h	1	0	3	2025
05090103 06 01	Headwaters Rocky Fork	26.24	3	5h	4n	0	4	2025
05090103 06 02	Long Run	18.06	3	5h	5	0	7	2025
05090103 06 03	McConnel Creek-Rocky Fork	24.71	1	5	1	0	4	2025
05090103 06 04	Frederick Creek	15.7	3	5h	1	0	2	2025
05090103 06 05	Wards Run-Little Scioto River	40.42	5	1h	1	0	2	2025
05090103 06 06	Munn Run-Ohio River	34.85	3	5h	5	0	2	2025
05090201 02 01	Headwaters Turkey Creek	16.31	1	3	4n	0	0	2016
05090201 02 02	Odell Creek-Turkey Creek	30.95	3	3	1	0	0	2016
05090201 02 03	Pond Run	12.18	3	3	5hx	0	4	2016
05090201 02 04	Briery Branch-Ohio River	35.94	3	3	5hx	0	4	2016
05090201 02 05	Upper Twin Creek	17.27	3	3	5hx	0	4	2016
05090201 02 06	Lower Twin Creek	16.04	3	3	5hx	0	4	2016
05090201 02 07	Rock Run-Ohio River	19.16	3	3	5hx	0	4	2016
05090201 02 09	Stout Run	14.1	3	3	5hx	0	4	2016
05090201 02 10	Quicks Run-Ohio River	46.66	3	3	5hx	0	4	2016
05090201 03 01	Headwaters Ohio Brush Creek	25.38	3	1h	4n	0	0	2022
05090201 03 02	Elk Run	15.14	3	5h	4n	0	2	2022
05090201 03 03	Baker Fork	43.97	3	5h	5	0	4	2022
05090201 03 04	Middle Fork Ohio Brush Creek	20.43	3	1h	1	0	0	2022

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05090201 03 05	Flat Run-Ohio Brush Creek	24.87	3	1h	4n	0	0	2022
05090201 04 01	Little West Fork Ohio Brush Creek	22.57	3	1h	5	0	1	2022
05090201 04 02	Headwaters West Fork Ohio Brush Creek	38.87	3	1h	5	0	1	2022
05090201 04 03	Cherry Fork	33.82	3	1h	5	0	1	2022
05090201 04 04	Georges Creek-West Fork Ohio Brush Creek	38.74	3	1h	5	0	1	2022
05090201 05 01	Little East Fork-Ohio Brush Creek	46.89	1	1	4n	0	0	2022
05090201 05 02	Lick Fork	31.7	1	1h	4n	0	0	2022
05090201 05 03	Bundle Run-Ohio Brush Creek	17.23	1h	1h	1	0	0	2022
05090201 05 04	Cedar Run-Ohio Brush Creek	26.69	3	1h	1	0	0	2022
05090201 05 05	Beasley Fork	18.22	3	5	1	0	4	2022
05090201 05 06	Soldiers Run-Ohio Brush Creek	29.84	5	1h	1	0	2	2022
05090201 06 01	Crooked Creek-Ohio River	58.56	3	3	3x	0	0	2016
05090201 06 04	Big Threemile Creek	23.63	5h	3	3x	0	2	2016
05090201 06 05	Lawrence Creek-Ohio River	58.26	3	3	3x	0	0	2016
05090201 07 01	Headwaters West Fork Eagle Creek	39.51	3	3	5hx	0	2	2016
05090201 07 02	Headwaters East Fork Eagle Creek	23.68	3	3	5hx	0	2	2016
05090201 07 03	Hills Fork-East Fork Eagle Creek	24.35	3	3	5hx	0	2	2016
05090201 07 04	Rattlesnake Creek-West Fork Eagle Creek	19.19	3	3	5hx	0	2	2016
05090201 07 05	Eagle Creek	44.81	3	3	5hx	0	2	2016
05090201 08 01	Redoak Creek	19.73	3	3	5hx	0	1	2016
05090201 08 02	Headwaters Straight Creek	43.97	3	1	5hx	5	6	2016
05090201 08 03	Evans Run-Straight Creek	23.53	3	3	5hx	0	1	2016
05090201 08 04	Lee Creek-Ohio River	35.44	3	3	5hx	0	1	2016
05090201 09 01	Headwaters East Fork Whiteoak Creek	36.39	3	4Ah	1	0	0	2021
05090201 09 02	Slabcamp Run-East Fork Whiteoak Creek	43.72	3	4A	4A	0	0	2021
05090201 09 03	Little North Fork-North Fork Whiteoak Creek	37.06	3	4Ah	4A	0	0	2021
05090201 09 04	Flat Run-North Fork Whiteoak Creek	30.39	3	5h	4A	0	2	2021
05090201 10 01	Sterling Run	29.64	3i	4A	4A	4A	0	2021
05090201 10 02	Miranda Run-Whiteoak Creek	39.8	3	1h	4A	0	0	2021

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05090201 10 03	Big Run-Whiteoak Creek	17.84	3	5	4A	0	5	2021
05090201 11 02	Turtle Creek-Ohio River	21.98	3	3	3	0	0	2029
05090201 11 03	West Branch Bullskin Creek	27.58	3	3	1	0	0	2029
05090201 11 04	Bullskin Creek	25.49	3	5	5	0	8	2029
05090201 11 06	Bear Creek-Ohio River	55.7	3i	5	1	0	3	2029
05090201 11 07	Little Indian Creek-Ohio River	24.45	3	1	1	0	0	2029
05090201 12 01	Headwaters Big Indian Creek	21.52	3	1	4n	0	0	2029
05090201 12 02	North Fork Indian Creek-Big Indian Creek	18.42	3	1	1	0	0	2029
05090201 12 03	Boat Run-Ohio River	15.86	3	1	1	0	0	2029
05090201 12 04	Ferguson Run-Twelvemile Creek	19.51	3	5	4n	0	3	2029
05090201 12 06	Tenmile Creek	13.04	3	5	1	0	1	2029
05090201 12 08	Ninemile Creek-Ohio River	41.61	3	5	5	0	8	2029
05090202 01 01	Headwaters Little Miami River	31.25	5h	5	4A	0	5	2026
05090202 01 02	North Fork Little Miami River	35.7	5h	5	5d	0	9	2026
05090202 01 03	Buffenbarger Cemetery-Little Miami River	22.06	5h	5	4A	0	5	2026
05090202 01 04	Yellow Springs Creek-Little Miami River	39.6	5h	5	1d	0	8	2026
05090202 02 01	North Fork Massies Creek	30.96	5h	5	5	0	9	2026
05090202 02 02	South Fork Massies Creek	20.4	5h	5	1d	0	6	2026
05090202 02 03	Massies Creek	34.51	5h	5	1d	0	4	2026
05090202 02 04	Little Beaver Creek	26.48	5h	5	5	0	7	2026
05090202 02 05	Beaver Creek	22.67	5h	5	5	0	9	2026
05090202 02 06	Shawnee Creek-Little Miami River	32.07	5h	5	5d	0	10	2026
05090202 03 01	Headwaters Anderson Fork	35.74	3	5	5	0	4	2026
05090202 03 02	Painters Run-Anderson Fork	41.82	3	5	5	0	8	2026
05090202 03 03	Mouth Anderson Fork	16.94	3i	5	4n	0	3	2026
05090202 04 01	North Branch Caesar Creek	26.72	1h	5	4n	0	3	2026
05090202 04 02	Upper Caesar Creek	13.57	1h	5	4n	0	3	2026
05090202 04 03	South Branch Caesar Creek	18.97	1h	5	5d	0	6	2026
05090202 04 04	Middle Caesar Creek	30.09	1	1	4n	0	0	2026
05090202 04 05	Flat Fork	16.8	1h	1	5	0	1	2026

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05090202 04 06	Lower Caesar Creek	41.18	1	1	4n	3i	1	2026
05090202 05 01	Sugar Creek	33.8	5h	5	4n	0	5	2026
05090202 05 02	Town of Bellbrook-Little Miami River	14.18	5h	5	1d	0	5	2026
05090202 05 03	Glady Run	13.57	5h	5	5d	0	7	2026
05090202 05 04	Newman Run-Little Miami River	57.47	5	5	4n	0	8	2026
05090202 06 01	Dutch Creek	14.84	1h	3	1	0	0	2022
05090202 06 02	Headwaters Todd Fork	33.44	1h	3	1	0	0	2022
05090202 06 03	Lytle Creek	20.41	1h	4A	4A	0	0	2022
05090202 06 04	Headwaters Cowan Creek	31.51	1	3	4A	3i	1	2022
05090202 06 05	Wilson Creek-Cowan Creek	22.08	1	1h	4n	0	0	2022
05090202 06 06	Little Creek-Todd Fork	24.39	1h	1h	1	0	0	2022
05090202 07 01	East Fork Todd Fork	39.64	3i	4Ah	4n	0	0	2022
05090202 07 02	Second Creek	19.96	3	4A	4A	5	5	2022
05090202 07 03	First Creek	19.5	3	3	5	0	1	2022
05090202 07 04	Lick Run-Todd Fork	35.69	3	4Ah	1	0	0	2022
05090202 08 01	Ferris Run-Little Miami River	30.17	3	3	3	0	0	2022
05090202 08 02	Little Muddy Creek	20.58	3	3	4A	0	0	2022
05090202 08 03	Turtle Creek	44.91	3	5h	4n	0	2	2022
05090202 08 04	Halls Creek-Little Miami River	20.47	3	3	3	0	0	2022
05090202 09 01	Muddy Creek	15.86	3	4A	5	0	2	2022
05090202 09 02	O'Bannon Creek	59.34	3	5	4n	0	4	2022
05090202 09 03	Salt Run-Little Miami River	35.3	3	5	3	0	2	2022
05090202 10 01	Turtle Creek	18.22	1h	5	5	0	7	2027
05090202 10 02	Headwaters East Fork Little Miami River	30.01	1	5	5	0	8	2027
05090202 10 03	Headwaters Dodson Creek	16.12	1h	3	5	0	4	2027
05090202 10 04	Anthony Run-Dodson Creek	16.26	1h	5	5	0	7	2027
05090202 10 05	West Fork East Fork Little Miami River	28.88	1h	5	5	5	12	2027
05090202 10 06	Glady Creek-East Fork Little Miami River	41.44	1h	5	5	0	5	2027
05090202 11 01	Solomon Run-East Fork Little Miami River	42.96	1h	5	5	0	6	2027
05090202 11 02	Fivemile Creek-East Fork Little Miami River	42.56	1h	5	5	0	7	2027

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05090202 11 03	Todd Run-East Fork Little Miami River	23.27	1	3	5	0	3	2027
05090202 12 01	Poplar Creek	24.68	1h	3	5	0	3	2027
05090202 12 02	Cloverlick Creek	42.32	1h	5	5	0	5	2027
05090202 12 03	Lucy Run-East Fork Little Miami River	32.48	1	1	5	5	7	2027
05090202 12 04	Backbone Creek-East Fork Little Miami River	20.8	1h	5	5	0	7	2027
05090202 13 01	Headwaters Stonelick Creek	24.26	1	1	5	5	6	2027
05090202 13 02	Brushy Fork	14.92	1h	3	5	0	3	2027
05090202 13 03	Moores Fork-Stonelick Creek	19.37	1h	5	5	0	3	2027
05090202 13 04	Lick Fork-Stonelick Creek	18.31	1	5	1	0	3	2027
05090202 13 05	Salt Run-East Fork Little Miami River	42.49	1	5	5	0	8	2027
05090202 14 01	Sycamore Creek	23.35	3	5	5d	0	5	2022
05090202 14 02	Polk Run-Little Miami River	16.96	3	5	5d	0	5	2022
05090202 14 03	Horner Run-Little Miami River	21.47	3	3	3	0	0	2022
05090202 14 04	Duck Creek	15.45	3	3	5d	0	1	2022
05090202 14 05	Dry Run-Little Miami River	17.78	3	3	5d	0	3	2022
05090202 14 06	Clough Creek-Little Miami River	18.7	3	3	5d	0	1	2022
05090203 01 01	East Fork Mill Creek-Mill Creek	47.28	5h	5	5	0	7	2029
05090203 01 02	West Fork Mill Creek	36.21	5h	1	5	0	3	2029
05090203 01 03	Sharon Creek-Mill Creek	31.8	5h	5	5	0	7	2029
05090203 01 04	Congress Run-Mill Creek	29.96	5h	3	5	0	3	2029
05090203 01 05	West Fork-Mill Creek	23.62	5	3	5	0	3	2029
05090203 02 01	Town of Newport-Ohio River	16.82	3	3	3	0	0	2029
05090203 02 02	Dry Creek-Ohio River	54.44	3	5	5	0	5	2029
05090203 02 03	Muddy Creek	16.59	3	5	5	0	2	2029
05090203 02 04	Garrison Creek-Ohio River	25.91	3	3	3	0	0	2029
05120101 01 01	Headwaters Wabash River	31.49	3i	3	5hx	0	1	2022
05120101 01 02	Stoney Creek-Wabash River	59.17	3	3	5hx	0	1	2022
05120101 01 03	Toti Creek-Wabash River	33.76	3	3	5hx	0	1	2022
05120101 02 01	Chickasaw Creek	18.63	5h	4Ahx	4Ah	0	2	2022
05120101 02 02	Headwaters Beaver Creek	20.28	5h	4Ahx	4Ah	0	2	2022

Section L1. Status of Watershed Assessment Units

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05120101 02 03	Coldwater Creek	19.36	5h	4A	4Ah	0	2	2022
05120101 02 04	Grand Lake-St Marys	54.1	5	4Ahx	4Ah	5	7	2022
05120101 03 01	Little Beaver Creek	14.1	3	4Ahx	4Ah	0	0	2022
05120101 03 02	Hardin Creek-Beaver Creek	19.25	3	4A	4Ah	0	0	2022
05120101 03 03	Prairie Creek-Beaver Creek	24.65	3	4Ahx	4Ah	0	0	2022
05120101 04 01	Wilson Creek-Limberlost Creek	1.70	3	3	3	0	0	2022
05120101 05 01	Hickory Branch-Wabash River	23.46	3	3	5hx	0	1	2022
05120103 01 01	Little Mississinewa River	20.9	3	3	5hx	0	4	2022
05120103 01 02	Gray Branch-Mississinewa River	31.75	3	3	5hx	0	4	2022
05120103 01 03	Jordan Creek-Mississinewa River	25.79	3	3	5hx	0	4	2022

Section L2. Status of Large River Assessment Units

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100005 90 01	Maumee River Mainstem (IN border to Tiffin River)	2315	5	5	1	5	11	2027
04100006 90 01	Tiffin River Mainstem (Brush Creek to mouth)	777	5	5	1	0	8	2027
04100007 90 01	Auglaize River Mainstem (Ottawa River to mouth)	2435	5	1	1	0	2	2027
04100008 90 01	Blanchard River Mainstem (Dukes Run to mouth)	771	5	3	1	3i	3	2020
04100009 90 01	Maumee River Mainstem (Tiffin River to Beaver Creek)	6058	5	5	5	5h	13	2027
04100009 90 02	Maumee River Mainstem (Beaver Creek to Maumee Bay)	6608	5	5	5	5h	16	2027
04100011 90 01	Sandusky River Mainstem (Tymochtee Creek to Wolf Creek)	1073	5	4Ah	4A	3i	3	2024
04100011 90 02	Sandusky River Mainstem (Wolf Creek to Sandusky Bay)	1420	5	1d	4A	5	7	2024
04110002 90 01	Cuyahoga River Mainstem (Brandywine Cr. to mouth); including old channel	809	5	4A	4A	0	2	2018
04110004 90 01	Grand River Mainstem (Mill Creek to mouth)	705	5h	4Ah	1	0	2	2019
05030103 90 01	Mahoning River Mainstem (Eagle Creek to Pennsylvania Border)	1075	5	5	5	0	12	2028
05030204 90 01	Hocking River Mainstem (Scott Creek to Margaret Creek)	877	5h	5h	1	0	6	2019
05030204 90 02	Hocking River (Margaret Creek to Ohio River)	1197	5h	5h	1	0	8	2019
05040001 90 01	Tuscarawas River Mainstem (Chippewa Creek to Sandy Creek)	586	5h	5h	4A	0	8	2017
05040001 90 02	Tuscarawas River Mainstem (Sandy Creek to Stillwater Creek)	1870	5h	3	1	0	2	2017
05040001 90 03	Tuscarawas River Mainstem (Stillwater Creek to Muskingum River)	2596	5h	5h	1	0	7	2017
05040002 90 01	Mohican River Mainstem (entire length)	1004	5	5h	1	0	8	2023

Section L2. Status of Large River Assessment Units

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05040003 90 01	Walhonding River Mainstem (entire length)	2256	5	1h	4C	0	2	2023
05040004 90 01	Muskingum River Mainstem (Tuscarawas/Walhonding confluence to Licking River)	6071	5	5h	1	0	8	2018
05040004 90 02	Muskingum River Mainstem (Licking River to Meigs Creek)	7480	5	5h	4C	0	6	2018
05040004 90 03	Muskingum River Mainstem (Meigs Creek to Ohio River)	8051	5	5h	1	0	6	2018
05040005 90 01	Wills Creek Mainstem (Salt Fork to mouth); excluding Wills Creek Lake	853	3	5	5	0	8	2029
05040006 90 01	Licking River Mainstem (entire length); excluding Dillon Lake	779	5	5h	5	0	8	2023
05060001 90 01	Scioto River Mainstem (L. Scioto R. to Olentangy R.); excluding O'Shaughnessy and Griggs reservoirs	1068	5	3i	5	1	6	2025
05060001 90 02	Scioto River Mainstem (Olentangy River to Big Darby Creek)	2641	5	5	5	0	10	2025
05060002 90 01	Scioto River Mainstem (Big Darby Creek to Paint Creek)	3866	5	5	1	0	6	2026
05060002 90 02	Scioto River Mainstem (Paint Creek to Sunfish Creek)	5936	5	1	1	0	2	2026
05060002 90 03	Scioto River Mainstem (Sunfish Creek to Ohio River)	6517	5	3	1	0	2	2026
05060003 90 01	Paint Creek Mainstem (Paint Creek Lake dam to mouth)	1144	5	5h	5	0	8	2022
05080001 90 01	Great Miami River Mainstem (Tawawa Creek to Mad River)	1853	5	5h	5	3i	10	2024

Section L2. Status of Large River Assessment Units

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05080001 90 02	Stillwater River Mainstem (Greenville Creek to mouth)	676	1	5	4C	0	4	2028
05080001 90 03	Mad River Mainstem (Donnels Creek to mouth)	657	5h	5	4A	3i	6	2018
05080002 90 01	Great Miami River Mainstem (Mad River to Four Mile Creek)	3298	5	5h	5	0	8	2025
05080002 90 02	Great Miami River Mainstem (Four Mile Creek to Ohio River)	5371	5	5	5	0	11	2025
05080003 90 01	Whitewater River Mainstem (entire length)	1474	5	3	1	0	2	2017
05090101 90 01	Raccoon Creek Mainstem (Little Raccoon Creek to mouth)	681	3i	3i	1	0	0	2016
05090202 90 01	Little Miami River Mainstem (Caesar Creek to O'Bannon Creek)	1086	5	4Ah	1	0	2	2022
05090202 90 02	Little Miami River Mainstem (O'Bannon Creek to Ohio River)	1757	5	4A	5	0	4	2022

Section L3. Status of Lake Erie Assessment Units

Assessment Unit	Assessment Unit Name	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
24001 001	Lake Erie Western Basin Shoreline (including Maumee Bay and Sandusky Bay)	5	5	5	5	14	2020
24001 002	Lake Erie Central Basin Shoreline	5	5	5	5	14	2020
24001 003	Lake Erie Islands Shoreline	5	1	5	5	8	2020

Section L4. Section 303(d) List of Prioritized Impaired Waters

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100009 90 02	Maumee River Mainstem (Beaver Creek to Maumee Bay)	6608	5	5	5	5h	16	2027
24001 001	Lake Erie Western Basin Shoreline (including Maumee Bay and Sandusky Bay)	0	5	5	5	5	14	2020
24001 002	Lake Erie Central Basin Shoreline	0	5	5	5	5	14	2020
04100009 90 01	Maumee River Mainstem (Tiffin River to Beaver Creek)	6058	5	5	5	5h	13	2027
04100007 12 06	Big Run-Flatrock Creek	48.28	5	5	5	1	12	2029
05060001 04 06	Glade Run-Scioto River	38.34	5h	5h	5	3i	12	2024
05090202 10 05	West Fork East Fork Little Miami River	28.88	1h	5	5	5	12	2027
05030103 90 01	Mahoning River Mainstem (Eagle Creek to Pennsylvania Border)	1075	5	5	5	0	12	2028
04100006 03 03	Flat Run-Tiffin River	33.17	5	5	5	3i	11	2028
04110001 02 03	Rocky River	25.34	5	5	5	0	11	2029
04110002 01 02	West Branch Cuyahoga River	35.98	5h	5	4Ah	0	11	2018
04100005 90 01	Maumee River Mainstem (IN border to Tiffin River)	2315	5	5	1	5	11	2027
05080002 90 02	Great Miami River Mainstem (Four Mile Creek to Ohio River)	5371	5	5	5	0	11	2025
04100003 02 04	West Branch St Joseph River	16.27	5	5	5	0	10	2028
04100006 05 02	Brush Creek	66.01	5h	5	5	0	10	2028
04100009 04 02	North Turkeyfoot Creek	50.01	3	5	5hx	3i	10	2015
04100012 02 04	Mouth Vermilion River	28.13	5h	5	5h	1	10	2021
04110003 01 05	Lower Ashtabula River	18.27	5	5	5	0	10	2026
05030103 08 06	Burgess Run-Yellow Creek	20.19	5h	5	5	1	10	2028
05040003 03 04	Delano Run-Kokosing River	32.95	3i	5	5	0	10	2022
05080002 07 04	Dicks Creek	27.71	5h	5h	5	0	10	2025
05090202 02 06	Shawnee Creek-Little Miami River	32.07	5h	5	5d	0	10	2026
05060001 90 02	Scioto River Mainstem (Olentangy River to Big Darby Creek)	2641	5	5	5	0	10	2025
05080001 90 01	Great Miami River Mainstem (Tawawa Creek to Mad River)	1853	5	5h	5	3i	10	2024
04100001 03 07	Heldman Ditch-Ottawa River	28.15	5	5	5	0	9	2026

Section L4. Section 303(d) List of Prioritized Impaired Waters

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100003 03 03	Eagle Creek	35	5h	5	5	0	9	2028
04100009 03 02	Lower Bad Creek	41.46	1h	5	5hx	5	9	2015
04100009 06 03	Haskins Road Ditch-Maumee River	15.73	3	5	3x	5	9	2015
04100011 12 03	Green Creek	30.78	1	5	4A	5	9	2024
04110001 01 08	Baker Creek-West Branch Rocky River	26.08	5	5	5	0	9	2029
04110002 05 04	Town of Twinsburg-Tinkers Creek	55.53	5h	5	5	0	9	2018
05030101 10 02	Salem Creek	15.3	5h	5h	5	0	9	2025
05030106 03 01	Crabapple Creek	19.66	5h	5h	5	0	9	2025
05030106 03 03	Cox Run-Wheeling Creek	39.3	5	5	5	1	9	2025
05040001 04 04	Muddy Fork	17.14	5h	5h	5	0	9	2025
05040001 04 05	Reeds Run-Still Fork	19.47	5h	5h	5	0	9	2025
05040001 04 06	Headwaters Sandy Creek	32.13	5	5	5	0	9	2025
05040001 06 06	Indian Run-Sandy Creek	39.78	5h	5	5	0	9	2025
05040002 02 04	Outlet Rocky Fork	47.81	5h	5	5	0	9	2023
05040002 03 03	Town of Lexington-Clear Fork Mohican River	29.63	3	5	5	0	9	2023
05040003 06 04	Jennings Ditch-Killbuck Creek	41.59	3i	5h	5	0	9	2024
05040003 07 05	Shrimplin Creek-Killbuck Creek	47.56	3	5	5	0	9	2024
05060001 06 02	Middle Mill Creek	59.91	3	5	5d	1	9	2027
05060002 04 02	Yellowbud Creek	36.58	5h	5	5	0	9	2026
05080002 09 01	Pleasant Run	15.1	5h	5h	5	0	9	2025
05090101 03 04	Flat Run-Raccoon Creek	54.55	3	5	5hx	0	9	2016
05090103 01 03	Ice Creek	39.05	5	5h	5	0	9	2025
05090202 01 02	North Fork Little Miami River	35.7	5h	5	5d	0	9	2026
05090202 02 01	North Fork Massies Creek	30.96	5h	5	5	0	9	2026
05090202 02 05	Beaver Creek	22.67	5h	5	5	0	9	2026
04100003 03 01	Nettle Creek	36.43	1	5	5	0	8	2028
04100003 05 05	Willow Run-St Joseph River	16.46	5	5	1	0	8	2028
04100005 02 03	Marie DeLarme Creek	49.04	3	5	5hx	0	8	2015
04100005 02 06	Platter Creek	21.68	3	5	5hx	0	8	2015
04100005 02 07	Sulphur Creek-Maumee River	18.22	3	5	5hx	0	8	2015

Section L4. Section 303(d) List of Prioritized Impaired Waters

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100005 02 08	Snooks Run-Maumee River	24.95	3	5	5hx	0	8	2015
04100009 04 03	Dry Creek-Maumee River	27.36	3	5	5hx	0	8	2015
04110001 01 01	Plum Creek	12.87	5h	5	5	0	8	2029
04110002 03 05	Fish Creek-Cuyahoga River	35.41	5	5	4A	0	8	2018
04110002 05 01	Pond Brook	16.62	5h	5	5	0	8	2018
04110003 02 01	Indian Creek-Frontal Lake Erie	29.21	3	5	5hx	0	8	2015
04110003 02 03	Arcola Creek	23.53	3	5	5hx	0	8	2015
05030101 06 10	Bieler Run-Little Beaver Creek	16.69	5h	5	1ht	0	8	2020
05030101 10 01	Upper Cross Creek	23.29	5h	5h	5	0	8	2025
05030201 06 03	Wolfpen Run-Little Muskingum River	21.25	3	5	5h	0	8	2015
05030201 07 05	Eightmile Creek-Little Muskingum River	41.68	5	5	5h	0	8	2015
05040001 06 05	Armstrong Run-Sandy Creek	32.2	5	5	1	0	8	2025
05040001 13 03	Boggs Fork	36.74	3	5	5	0	8	2027
05040004 03 05	Blount Run-Muskingum River	45.32	3	5h	5	0	8	2025
05040006 02 05	Log Pond Run-North Fork Licking River	22.96	3	5h	5	1	8	2023
05040006 04 03	Buckeye Lake	27.06	1	5	5	0	8	2023
05060001 03 04	Honey Creek-Little Scioto River	19.05	5h	5h	5	0	8	2024
05060002 04 05	Scippo Creek	35.1	5	5	5	0	8	2026
05060002 09 04	Pike Run	23.42	5h	5h	5	0	8	2021
05060002 13 03	Little Beaver Creek-Big Beaver Creek	30.34	1	5	5	0	8	2026
05080001 04 06	Turkeyfoot Creek-Great Miami River	37.46	5h	5	4A	0	8	2023
05080001 20 04	Pleasant Run-Honey Creek	30.4	3	5	5	0	8	2024
05080002 01 04	Holes Creek	27.13	5h	5h	5	0	8	2025
05080002 06 04	Acton Lake Dam-Four Mile Creek	41.37	1h	5	5	0	8	2020
05090103 02 03	Little Pine Creek	29.52	5h	5h	5	0	8	2025
05090201 11 04	Bullskin Creek	25.49	3	5	5	0	8	2029
05090201 12 08	Ninemile Creek-Ohio River	41.61	3	5	5	0	8	2029
05090202 01 04	Yellow Springs Creek-Little Miami River	39.6	5h	5	1d	0	8	2026
05090202 03 02	Painters Run-Anderson Fork	41.82	3	5	5	0	8	2026
05090202 05 04	Newman Run-Little Miami River	57.47	5	5	4n	0	8	2026

Section L4. Section 303(d) List of Prioritized Impaired Waters

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05090202 10 02	Headwaters East Fork Little Miami River	30.01	1	5	5	0	8	2027
05090202 13 05	Salt Run-East Fork Little Miami River	42.49	1	5	5	0	8	2027
04100006 90 01	Tiffin River Mainstem (Brush Creek to mouth)	777	5	5	1	0	8	2027
05030204 90 02	Hocking River (Margaret Creek to Ohio River)	1197	5h	5h	1	0	8	2019
05040001 90 01	Tuscarawas River Mainstem (Chippewa Creek to Sandy Creek)	586	5h	5h	4A	0	8	2017
05040002 90 01	Mohican River Mainstem (entire length)	1004	5	5h	1	0	8	2023
05040004 90 01	Muskingum River Mainstem (Tuscarawas/Walhonding confluence to Licking River)	6071	5	5h	1	0	8	2018
05040005 90 01	Wills Creek Mainstem (Salt Fork to mouth); excluding Wills Creek Lake	853	3	5	5	0	8	2029
05040006 90 01	Licking River Mainstem (entire length); excluding Dillon Lake	779	5	5h	5	0	8	2023
05060003 90 01	Paint Creek Mainstem (Paint Creek Lake dam to mouth)	1144	5	5h	5	0	8	2022
05080002 90 01	Great Miami River Mainstem (Mad River to Four Mile Creek)	3298	5	5h	5	0	8	2025
24001 003	Lake Erie Islands Shoreline	0	5	1	5	5	8	2020
04100001 03 02	Halfway Creek	39.89	5h	5	5	0	7	2026
04100001 03 04	Headwaters Tenmile Creek	48.29	1	5	5	0	7	2026
04100001 03 05	North Tenmile Creek	40.51	5h	5	5	0	7	2026
04100001 03 06	Tenmile Creek	14.97	5h	5	5	0	7	2026
04100001 03 08	Sibley Creek-Ottawa River	22.35	5	5	5	0	7	2026
04100004 01 02	Center Branch St Marys River	29	5h	5	5hx	0	7	2015
04100004 02 04	Twelvemile Creek	23.58	5h	5	5hx	0	7	2015
04100004 02 05	Prairie Creek-St Marys River	42.22	5	5	5hx	0	7	2015
04100006 02 04	Mill Creek	40.74	3	5	5	0	7	2028
04100006 03 01	Bates Creek-Tiffin River	29.29	1	5	5	1	7	2028
04100006 04 01	Upper Lick Creek	28	3	5	5	0	7	2028
04100006 05 01	Beaver Creek	45.14	5h	5	5	0	7	2028
04100006 05 03	Village of Stryker-Tiffin River	25.25	5	5	1	0	7	2028

Section L4. Section 303(d) List of Prioritized Impaired Waters

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
04100006 06 02	Mud Creek	26.6	1h	5	5	0	7	2028
04100007 04 03	Honey Run	28.04	5h	4A	4A	5	7	2025
04100007 10 04	Lower Blue Creek	48.13	3i	5	5	0	7	2029
04100007 12 05	Wildcat Creek-Flatrock Creek	55.82	3	5	5	0	7	2029
04100009 02 01	Preston Run-Maumee River	17.09	3	5	5hx	0	7	2015
04100009 02 02	Benien Creek	24.03	3	5	5hx	0	7	2015
04100009 05 05	Brush Creek	25.11	3	5	5hx	0	7	2015
04100009 05 09	Lower Beaver Creek	16.78	3	5	5hx	0	7	2015
04110001 01 02	North Branch West Branch Rocky River	25.07	5h	5	5	0	7	2029
04110002 01 05	Black Brook	12.72	5h	3	1ht	0	7	2018
04110002 03 01	Plum Creek	12.97	5h	3	1ht	0	7	2018
04110002 03 03	Wingfoot Lake outlet-Little Cuyahoga River	30.79	5	5	5	0	7	2018
04110002 05 02	Headwaters Tinkers Creek	25.25	5h	5	5	0	7	2018
04110003 02 02	Wheeler Creek-Frontal Lake Erie	32.83	3	5	5hx	0	7	2015
04110003 02 04	McKinley Creek-Frontal Lake Erie	29.67	3	5	5hx	0	7	2015
05030102 01 04	Frontal Pymatuning Reservoir	42.67	5h	5	5	0	7	2023
05030103 07 03	Lower Meander Creek	30.68	5	5	5	1	7	2028
05030106 02 02	Middle Fork Short Creek	24.16	3	5	5	0	7	2025
05040001 01 04	Wolf Creek	39.16	5h	4A	4Ah	5	7	2017
05040001 14 01	Skull Fork	46.37	3	5	5	0	7	2027
05040001 16 01	Laurel Creek	28.73	3	5	5	0	7	2027
05040001 16 04	Town of Uhrichsville-Stillwater Creek	29.02	3	5	5	3	7	2027
05040002 01 01	Marsh Run	20.84	3	5h	5	3i	7	2023
05040002 01 02	Headwaters Black Fork Mohican River	39.47	3	5	5	3i	7	2023
05040002 01 05	Shipp Creek-Black Fork Mohican River	61.62	3	5h	5	0	7	2023
05040002 06 05	Jerome Fork-Mohican River	35.55	3i	5	5	0	7	2023
05040003 01 01	Headwaters North Branch Kokosing River	45.29	1	5h	5	0	7	2022
05040003 02 01	Headwaters Kokosing River	36.42	3	5h	5	0	7	2022
05040003 04 01	Little Jelloway Creek	19.55	1	5	5	0	7	2022
05040004 09 03	Plumb Run-South Branch Wolf Creek	16.75	3	5	5	0	7	2028

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Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05040004 10 04	Hayward Run-Wolf Creek	41.89	3	5	5	0	7	2028
05040005 02 07	Trail Run-Wills Creek	22.98	1	5	5	1	7	2029
05040005 03 01	Headwaters Leatherwood Creek	35.09	3	5	5	0	7	2029
05040005 05 03	Peters Creek-Crooked Creek	27.74	3	5	5	0	7	2029
05040006 01 01	Otter Fork Licking River	28.27	3	5h	5	0	7	2023
05040006 01 02	Headwaters North Fork Licking River	32.96	3	5h	5	0	7	2023
05040006 01 04	Vance Creek-North Fork Licking River	18.93	3	5h	5	0	7	2023
05040006 06 04	Timber Run-Licking River	37.26	3	5h	5	0	7	2023
05060001 02 01	Headwaters Rush Creek	60.73	3	5	5	0	7	2024
05060001 02 03	Dudley Run-Rush Creek	29.86	5	5h	5	0	7	2024
05060001 03 01	Rock Fork	24.01	5h	5h	5	0	7	2024
05060001 03 03	City of Marion-Little Scioto River	22.16	3i	5	5	3i	7	2024
05060001 23 05	Dry Run	18.81	3	5h	5	0	7	2025
05060002 02 05	Deer Creek Lake-Deer Creek	27.7	5	5	5	0	7	2026
05060002 05 01	Kinnikinnick Creek	36.22	3	5	5	0	7	2026
05060002 16 03	Bear Creek-Scioto River	46.78	3	5	5	0	7	2026
05080001 11 01	Mud Creek	29.97	3	5	5d	3	7	2028
05080001 18 02	Pondy Creek-Mad River	16.74	5h	5h	4nh	0	7	2018
05080002 06 02	Little Four Mile Creek	30.65	1h	5h	5	0	7	2020
05090101 06 05	Claylick Run-Raccoon Creek	43.59	3	5h	5hx	0	7	2016
05090103 06 02	Long Run	18.06	3	5h	5	0	7	2025
05090202 02 04	Little Beaver Creek	26.48	5h	5	5	0	7	2026
05090202 05 03	Glady Run	13.57	5h	5	5d	0	7	2026
05090202 10 01	Turtle Creek	18.22	1h	5	5	0	7	2027
05090202 10 04	Anthony Run-Dodson Creek	16.26	1h	5	5	0	7	2027
05090202 11 02	Fivemile Creek-East Fork Little Miami River	42.56	1h	5	5	0	7	2027
05090202 12 03	Lucy Run-East Fork Little Miami River	32.48	1	1	5	5	7	2027
05090202 12 04	Backbone Creek-East Fork Little Miami River	20.8	1h	5	5	0	7	2027
05090203 01 01	East Fork Mill Creek-Mill Creek	47.28	5h	5	5	0	7	2029
05090203 01 03	Sharon Creek-Mill Creek	31.8	5h	5	5	0	7	2029

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05120101 02 04	Grand Lake-St Marys	54.1	5	4Ahx	4Ah	5	7	2022
04100011 90 02	Sandusky River Mainstem (Wolf Creek to Sandusky Bay)	1420	5	1d	4A	5	7	2024
05040001 90 03	Tuscarawas River Mainstem (Stillwater Creek to Muskingum River)	2596	5h	5h	1	0	7	2017
04100001 03 01	Shantee Creek	15.81	5h	5	5	0	6	2026
04100001 03 03	Prairie Ditch	18.63	5h	5	1	0	6	2026
04100003 03 05	Bear Creek	24.45	5h	5	1	0	6	2028
04100004 01 01	Muddy Creek	16.46	5h	5	5hx	0	6	2015
04100004 01 05	Sixmile Creek	17.61	5h	5	5hx	0	6	2015
04100004 02 01	Hussey Creek	12.37	5h	5	5hx	0	6	2015
04100005 02 04	Gordon Creek	44.15	3	5	5hx	0	6	2015
04100006 02 02	Deer Creek-Bean Creek	31.73	3	5	5	0	6	2028
04100006 04 03	Prairie Creek	29.78	3	5	5	0	6	2028
04100006 06 01	Lost Creek	32.33	3	5	5	0	6	2028
04100007 04 02	Dug Run-Ottawa River	13.27	5h	4A	5	0	6	2025
04100007 05 02	Plum Creek	39.84	5h	4A	5	0	6	2025
04100007 06 04	Dry Fork-Little Auglaize River	57.07	1	5	1	1	6	2029
04100007 08 02	Upper Town Creek	14.4	3	5	5	0	6	2029
04100007 08 04	Lower Town Creek	38.72	5	5	1	1	6	2029
04100007 10 01	Upper Prairie Creek	15.29	3	5	5	0	6	2029
04100007 12 07	Little Flatrock Creek	17.83	3	5	5	0	6	2029
04100009 05 01	Big Creek	21.52	3	5	5hx	0	6	2015
04100009 05 02	Hammer Creek	25.09	3	5	5hx	0	6	2015
04100009 05 07	Cutoff Ditch	22.06	3	5	5hx	0	6	2015
04100010 03 01	North Branch Portage River	64.41	5	4A	5	0	6	2021
04100011 02 04	Raccoon Creek	34.41	3i	4A	5	5	6	2024
04100012 01 03	Southwest Branch Vermilion River	31.16	5h	5	5h	0	6	2021
04100012 02 02	East Fork Vermilion River	35.05	5h	3	5	0	6	2021
04100012 02 03	Town of Wakeman-Vermilion River	28.91	5h	3	5h	0	6	2021
04110001 01 03	Headwaters West Branch Rocky River	22.98	5h	5	5	0	6	2029

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04110001 01 07	Plum Creek	17.54	5h	5	5	0	6	2029
04110001 02 02	Baldwin Creek-East Branch Rocky River	36.58	1	5	5	1	6	2029
04110001 03 02	Headwaters West Fork East Branch Black River	43.41	5h	4A	5d	0	6	2027
04110001 06 01	French Creek	38.44	5h	4A	5	0	6	2027
04110002 02 02	Feeder Canal-Breakneck Creek	45.04	5h	5	4Ah	1	6	2018
04110002 02 03	Lake Rockwell-Cuyahoga River	61.33	5	5	4Ah	5	6	2018
04110003 01 02	West Branch Ashtabula River	27.7	5h	5	1	0	6	2026
04110003 01 03	Upper Ashtabula River	23.28	5h	5	1	0	6	2026
04110003 03 02	Headwaters Aurora Branch	37.5	3	5	5d	0	6	2021
04120101 06 05	Marsh Run-Conneaut Creek	68.47	3i	5	1	0	6	2015
05030101 04 01	East Branch Middle Fork Little Beaver Creek	31.02	5h	5	4Ah	0	6	2020
05030101 08 02	Headwaters North Fork Yellow Creek	26.53	5h	5	4A	0	6	2020
05030101 10 04	McIntyre Creek	27.37	1	5h	5	0	6	2025
05030101 10 05	Lower Cross Creek	47.3	5	5h	5	0	6	2025
05030102 03 04	Booth Run-Pymatuning Creek	59.75	1	5h	4C	0	6	2023
05030102 06 02	Little Yankee Run	43.58	3	5	5	0	6	2023
05030106 02 07	Dry Fork-Short Creek	20.49	5	5h	1	0	6	2025
05030106 03 04	Flat Run-Wheeling Creek	23.29	5h	5	5	0	6	2025
05030106 12 01	Rush Run	12.48	3	5h	5	0	6	2025
05030201 07 03	Wingett Run-Little Muskingum River	36.34	3i	5	5h	0	6	2015
05030202 03 03	Big Run-East Branch Shade River	17.49	5h	5	3x	0	6	2015
05040001 13 01	Spencer Creek	24.03	3	5	5	0	6	2027
05040002 02 03	Headwaters Rocky Fork	29.41	5h	5h	5	0	6	2023
05040002 05 03	Lower Muddy Fork Mohican River	49.58	3	5h	5	0	6	2023
05040002 07 02	Mohicanville Dam-Lake Fork Mohican River	24.53	3	5h	5	0	6	2023
05040002 08 03	Big Run-Black Fork Mohican River	19.26	3i	5h	4n	0	6	2023
05040003 02 02	Mile Run-Kokosing River	38.6	3	5h	5	0	6	2022
05040003 04 02	Jelloway Creek	54.51	3	5	5	0	6	2022
05040003 08 04	Big Run-Killbuck Creek	27.4	1	5	1	0	6	2024
05040003 09 03	Beaver Run	14.08	3	5h	5	0	6	2025

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05040003 09 04	Simmons Run	16.47	3	5h	5	0	6	2025
05040004 09 02	Headwaters South Branch Wolf Creek	40.73	3	5	5	0	6	2028
05040004 11 04	Reasoners Run-Olive Green Creek	19.41	1	5	5	0	6	2028
05040005 02 03	South Fork Buffalo Creek-Buffalo Creek	19.11	3	5	5	0	6	2029
05040005 02 06	Chapman Run	19.38	3i	5	5	0	6	2029
05040005 04 02	Headwaters Salt Fork	55.75	3	5	5	0	6	2029
05040005 05 02	Headwaters Crooked Creek	16.01	3	5	5	0	6	2029
05040005 06 02	Twomile Run-Wills Creek	24.6	1	5	5	0	6	2029
05040006 03 02	Lobdell Creek	18.98	3	5h	5	0	6	2023
05040006 04 09	Beaver Run-South Fork Licking River	29.92	3	5	1	0	6	2023
05040006 06 03	Dillon Lake-Licking River	47.07	5	5h	1	0	6	2023
05060001 01 02	Headwaters Scioto River	76.32	3	5h	5	0	6	2024
05060001 01 04	Silver Creek-Scioto River	46.55	3	5h	5	0	6	2024
05060001 03 02	Headwaters Little Scioto River	47.52	3i	5h	5	0	6	2024
05060001 04 01	Gander Run-Scioto River	17.57	1	5	1	0	6	2024
05060001 04 03	Wolf Creek-Scioto River	22.47	5h	5h	4n	0	6	2024
05060001 04 05	Town of La Rue-Scioto River	19.84	1	5h	1	0	6	2024
05060001 06 04	Lower Mill Creek	47.24	1	5	5d	0	6	2027
05060001 07 04	Moors Run-Scioto River	24.84	3	5	5	0	6	2028
05060001 18 02	Tussing Ditch-Walnut Creek	22.93	5h	5	1t	0	6	2020
05060001 18 04	Little Walnut Creek	30.09	5h	5h	1t	0	6	2020
05060001 22 02	Gay Run-Big Darby Creek	25.29	5h	5	4n	0	6	2029
05060001 22 03	Greenbrier Creek-Big Darby Creek	36.19	5	5	1d	0	6	2029
05060001 22 04	Lizard Run-Big Darby Creek	24.59	5	5	1d	0	6	2029
05060001 23 04	Grove Run-Scioto River	57.15	5h	5	1	0	6	2025
05060002 01 03	Glade Run	20.6	3	5	5	0	6	2026
05060002 01 04	Walnut Run	15.26	3	5	5	0	6	2026
05060002 04 01	Hargus Creek	19.78	5h	5	1	0	6	2026
05060002 06 01	Beech Fork	19.93	5h	5h	4A	0	6	2021
05060002 06 02	Headwaters Salt Creek	27.86	5h	5h	4A	0	6	2021

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05060002 06 04	Pine Creek	40.46	5h	5h	4A	0	6	2021
05060002 07 01	Pigeon Creek	46.23	3	5h	5	0	6	2021
05060002 09 02	Queer Creek	21.2	5h	5h	4n	1	6	2021
05060002 09 06	Poe Run-Salt Creek	39.2	5	5h	1	0	6	2021
05060002 10 03	Headwaters Walnut Creek	35.71	5h	5	1	0	6	2026
05060002 10 04	Lick Run-Walnut Creek	23.49	5h	5	1	0	6	2026
05060002 16 02	Big Run-Scioto River	38.36	5	1	5	0	6	2026
05080001 11 03	Dividing Branch-Greenville Creek	47.82	5	5	1d	0	6	2028
05080001 15 04	Glady Creek-Mad River	34.79	5h	5	4Ah	0	6	2018
05080001 16 07	Bogles Run-Mad River	27.34	5h	5	4Ah	0	6	2018
05080001 18 05	Rock Run-Mad River	20.99	5h	5	4Ah	0	6	2018
05080002 01 02	Headwaters Wolf Creek	23.05	5h	5	5	0	6	2025
05080002 08 03	Beals Run-Indian Creek	73.96	5	5	4n	0	6	2019
05080002 09 05	Taylor Creek	26.66	5h	5h	5	0	6	2025
05090103 01 04	Storms Creek	37.2	5	1h	5	0	6	2025
05090103 02 01	Hales Creek	32.3	5h	5h	1	0	6	2025
05090103 02 02	Headwaters Pine Creek	33.34	5h	1h	5	0	6	2025
05090201 08 02	Headwaters Straight Creek	43.97	3	1	5hx	5	6	2016
05090202 02 02	South Fork Massies Creek	20.4	5h	5	1d	0	6	2026
05090202 04 03	South Branch Caesar Creek	18.97	1h	5	5d	0	6	2026
05090202 11 01	Solomon Run-East Fork Little Miami River	42.96	1h	5	5	0	6	2027
05090202 13 01	Headwaters Stonelick Creek	24.26	1	1	5	5	6	2027
05030204 90 01	Hocking River Mainstem (Scott Creek to Margaret Creek)	877	5h	5h	1	0	6	2019
05040004 90 02	Muskingum River Mainstem (Licking River to Meigs Creek)	7480	5	5h	4C	0	6	2018
05040004 90 03	Muskingum River Mainstem (Meigs Creek to Ohio River)	8051	5	5h	1	0	6	2018
05060001 90 01	Scioto River Mainstem (L. Scioto R. to Olentangy R.); excluding O'Shaughnessy and Griggs reservoirs	1068	5	3i	5	1	6	2025
05060002 90 01	Scioto River Mainstem (Big Darby Creek to Paint Creek)	3866	5	5	1	0	6	2026
05080001 90 03	Mad River Mainstem (Donnels Creek to mouth)	657	5h	5	4A	3i	6	2018

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04100003 03 02	Cogswell Cemetery-St Joseph River	9.76	5	5	1	0	5	2028
04100003 03 06	West Buffalo Cemetery-St Joseph River	13.72	5h	5	1	0	5	2028
04100003 05 01	Bluff Run-St Joseph River	23.74	5h	5	1	0	5	2028
04100003 05 02	Big Run	30.21	5h	5	1	0	5	2028
04100003 05 03	Russell Run-St Joseph River	17.98	5h	5	1	0	5	2028
04100004 01 04	Kopp Creek	33.82	5h	5	5	0	5	2015
04100004 01 06	Fourmile Creek-St Marys River	16.5	1	5	5	0	5	2015
04100004 03 02	Black Creek	29.52	5h	5	3x	0	5	2015
04100004 03 04	Duck Creek	15.89	5h	5	3x	0	5	2015
04100005 02 01	Zuber Cutoff	36.86	3	5	5hx	0	5	2015
04100007 10 05	Town of Charloe-Auglaize River	21.95	3	5	5	0	5	2029
04100009 01 02	Upper South Turkeyfoot Creek	21.03	3	5	5hx	0	5	2015
04100009 01 03	School Creek	38.87	3	5	5hx	0	5	2015
04100009 02 03	Wade Creek-Maumee River	37.31	3	5	5hx	0	5	2015
04100009 02 04	Garret Creek	28.59	3	5	5hx	0	5	2015
04100009 02 05	Oberhaus Creek	24	3	5	5hx	0	5	2015
04100009 02 06	Village of Napoleon-Maumee River	21.33	3	5	5hx	0	5	2015
04100009 02 07	Creager Cemetery-Maumee River	17.91	3	5	5hx	0	5	2015
04100009 04 01	Konzen Ditch	25.21	3	1	5hx	3i	5	2015
04100009 05 04	Upper Yellow Creek	34.63	3	5	5hx	0	5	2015
04100010 02 02	East Branch Portage River	36.15	1	4Ah	5	3i	5	2021
04100011 12 02	Beaver Creek	29.3	3i	4Ah	4A	5	5	2024
04100012 01 04	New London Upground Reservoir-Vermilion River	31.05	5h	3	5h	3	5	2021
04100012 01 05	Indian Creek-Vermilion River	34.51	5h	3	5h	0	5	2021
04100012 05 06	Mouth West Branch Huron River	21.51	3	5	1ht	3i	5	2016
04100012 06 03	Norwalk Creek	20.54	1h	4Ahx	4Ah	5	5	2016
04110002 02 01	Potter Creek-Breakneck Creek	34.18	5h	5	4Ah	0	5	2018
04110003 01 01	East Branch Ashtabula River	37.3	5h	5	4n	0	5	2026
04110003 04 02	Griswold Creek-Chagrin River	76.54	5	4A	5	0	5	2021
04110003 05 03	Euclid Creek	23.31	3	5	5	0	5	2015

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04110004 04 03	Town of Jefferson-Mill Creek	28.17	5	4A	5	0	5	2019
05030101 04 04	Lisbon Creek-Middle Fork Little Beaver Creek	19.72	5h	5	4Ah	0	5	2020
05030101 06 02	Honey Creek	24.24	5h	5	4Ah	0	5	2020
05030102 03 02	Sugar Creek-Pymatuning Creek	35.18	3	5h	5	0	5	2023
05030102 06 01	Yankee Run	44.81	3	5	5	0	5	2023
05030103 05 03	Lower Mosquito Creek	40.92	5	5	5	0	5	2028
05030103 08 05	Headwaters Yellow Creek	19.36	3	5	5	1	5	2028
05030106 09 01	North Fork Captina Creek	32.72	1	5	1	1	5	2024
05030106 09 04	Piney Creek-Captina Creek	29.07	3i	5	1	0	5	2024
05030106 12 02	Salt Run-Ohio River	29.37	3	5h	5	0	5	2025
05030201 01 01	Upper Sunfish Creek	35.1	3	1h	1	5	5	2024
05030201 01 03	Middle Sunfish Creek	19.88	3	5	1	0	5	2024
05030202 03 01	Horse Cave Creek	18.4	5h	5	3x	0	5	2015
05030202 03 02	Headwaters East Branch Shade River	37.53	5h	5	3x	0	5	2015
05030202 09 01	Kyger Creek	30.49	3	5	5	0	5	2015
05030202 09 02	Campaign Creek	46.61	3	5	5hx	0	5	2015
05040001 06 01	Hugle Run	21.4	5h	5h	1	0	5	2025
05040001 06 02	Pipe Run	27.71	5h	5h	4n	0	5	2025
05040001 06 03	Black Run	16.39	5h	5h	1	0	5	2025
05040001 06 04	Little Sandy Creek	21.15	5h	5h	1	0	5	2025
05040001 06 07	Beal Run-Sandy Creek	22.85	5	1	5	0	5	2025
05040001 15 03	Upper Little Stillwater Creek	29.72	1	1	3	5	5	2027
05040002 02 01	Village of Pavonia-Black Fork Mohican River	31.94	5h	1	5	0	5	2023
05040002 04 01	Honey Creek-Clear Fork Mohican River	24.63	3	5	1	0	5	2023
05040002 04 03	Slater Run-Clear Fork Mohican River	22.89	3	5h	1	0	5	2023
05040002 07 03	Plum Run-Lake Fork Mohican River	20.9	3	5h	1	0	5	2023
05040002 08 02	Town of Perrysville-Black Fork Mohican River	17.76	3i	5h	4n	0	5	2023
05040003 03 07	Indianfield Run-Kokosing River	23.7	3i	5	1	0	5	2022
05040003 05 04	Cedar Run-Killbuck Creek	39.39	3	5h	1	0	5	2024
05040003 05 05	Clear Creek-Killbuck Creek	22.6	3	5h	1	0	5	2024

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05040003 06 01	Little Apple Creek	12.83	3	5h	5	0	5	2024
05040003 06 07	Tea Run-Killbuck Creek	18.28	3	5h	3ih	0	5	2024
05040003 07 03	Honey Run-Killbuck Creek	15.91	3	5h	1	0	5	2024
05040003 08 02	Headwaters Doughty Creek	32.87	3	5	5	0	5	2024
05040003 08 05	Bucklew Run-Killbuck Creek	32.05	1	5h	1	0	5	2024
05040003 09 06	Headwaters Mill Creek	26.92	3	5h	5	0	5	2025
05040003 09 07	Spoon Creek-Mill Creek	24.28	3	5h	5	0	5	2025
05040004 08 03	Duncan Run-Muskingum River	21.36	3	5h	5	0	5	2028
05040005 02 04	North Fork Buffalo Creek-Buffalo Creek	30.93	3	5	5	0	5	2029
05040005 05 01	North Crooked Creek	17.78	3	5	1	3	5	2029
05040005 05 07	Johnson Fork-Birds Run	16.76	3	5	5	0	5	2029
05040006 02 03	Dog Hollow Run-North Fork Licking River	24.56	3	5	1	0	5	2023
05040006 05 01	Claylick Creek	20.76	5h	5h	1	0	5	2023
05060001 02 02	McDonald Creek	14.74	3	5h	5	0	5	2024
05060001 05 04	Fulton Creek	46.67	3	5	5	0	5	2024
05060001 12 04	Hayden Run-Scioto River	47.72	1	5h	5	0	5	2025
05060002 04 04	Congo Creek	16.69	5h	5	1	0	5	2026
05060002 06 03	Laurel Run	54.57	5h	5h	4A	0	5	2021
05060002 11 01	Carrs Run	13.74	3	5	5	0	5	2026
05060002 12 06	Leeth Creek-Sunfish Creek	25.66	5	5	1	0	5	2026
05080001 07 05	Garbry Creek-Great Miami River	43.83	1	3	3	5	5	2024
05080001 16 03	Nettle Creek	27.88	5h	5	4Ah	0	5	2018
05080001 20 05	Poplar Creek-Great Miami River	54.46	5h	5h	3	0	5	2024
05080002 01 01	North Branch Wolf Creek	23.75	5h	5h	1	0	5	2025
05080002 02 01	Millers Fork	24.56	5h	5h	4A	0	5	2019
05080002 02 02	Headwaters Twin Creek	44.2	5h	5h	4A	0	5	2019
05080002 02 03	Swamp Creek	17.52	5h	4Ah	5	0	5	2019
05080002 03 01	Bantas Fork	34.82	5h	1t	5	0	5	2019
05080002 03 05	Little Twin Creek	22.71	5h	5	4n	0	5	2019
05080002 06 05	Cotton Run-Four Mile Creek	51.33	1	5	5	0	5	2020

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05080002 09 02	Banklick Creek-Great Miami River	44.08	3i	5	5h	0	5	2025
05090101 04 01	Headwaters Little Raccoon Creek	59.96	1h	5	5	3	5	2016
05090201 10 03	Big Run-Whiteoak Creek	17.84	3	5	4A	0	5	2021
05090202 01 01	Headwaters Little Miami River	31.25	5h	5	4A	0	5	2026
05090202 01 03	Buffenbarger Cemetery-Little Miami River	22.06	5h	5	4A	0	5	2026
05090202 05 01	Sugar Creek	33.8	5h	5	4n	0	5	2026
05090202 05 02	Town of Bellbrook-Little Miami River	14.18	5h	5	1d	0	5	2026
05090202 07 02	Second Creek	19.96	3	4A	4A	5	5	2022
05090202 10 06	Glady Creek-East Fork Little Miami River	41.44	1h	5	5	0	5	2027
05090202 12 02	Cloverlick Creek	42.32	1h	5	5	0	5	2027
05090202 14 01	Sycamore Creek	23.35	3	5	5d	0	5	2022
05090202 14 02	Polk Run-Little Miami River	16.96	3	5	5d	0	5	2022
05090203 02 02	Dry Creek-Ohio River	54.44	3	5	5	0	5	2029
04100002 03 04	Little Bear Creek-Bear Creek	21.8	3	5	5	0	4	2026
04100003 03 04	Village of Montpelier-St Joseph River	20.83	5h	5	1	0	4	2028
04100004 01 03	East Branch St Marys River	21.26	5h	5	5hx	0	4	2015
04100004 02 03	Blierdofer Ditch	14.57	5h	5	5hx	0	4	2015
04100004 03 03	Yankee Run-St Marys River	59.44	1	5	3x	0	4	2015
04100004 03 05	Town of Willshire-St Marys River	13.4	1	5	3x	0	4	2015
04100005 02 02	North Chaney Ditch-Maumee River	18.44	3	3	5hx	0	4	2015
04100005 02 05	Sixmile Cutoff-Maumee River	15.7	3	3	5hx	0	4	2015
04100006 04 02	Middle Lick Creek	30.86	3	5	5	0	4	2028
04100006 06 03	Webb Run	20.39	3	5	4n	0	4	2028
04100007 02 04	Sixmile Creek-Auglaize River	29.9	5	5	4Ah	0	4	2018
04100007 03 06	Lima Reservoir-Ottawa River	27.36	5	4A	5	3	4	2025
04100007 06 01	Kyle Prairie Creek	19.05	3	5	1	0	4	2029
04100007 06 02	Long Prairie Creek-Little Auglaize River	26.19	3	5	1	0	4	2029
04100007 07 01	Hagarman Creek	16.15	3	5	1	0	4	2029
04100007 08 01	Dog Creek	57.69	5	5	1	0	4	2029
04100007 08 03	Maddox Creek	33.76	3	5	1	0	4	2029

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04100007 10 03	Middle Blue Creek	19.45	3	5	1	0	4	2029
04100009 01 01	West Creek	15.95	3	5	5hx	0	4	2015
04100009 01 04	Middle South Turkeyfoot Creek	36.24	3	5	5hx	0	4	2015
04100009 01 06	Lower South Turkeyfoot Creek	13.79	3	5	5hx	0	4	2015
04100009 05 03	Upper Beaver Creek	16.71	3	5	5hx	0	4	2015
04100009 05 08	Middle Beaver Creek	23.46	3	5	5hx	0	4	2015
04100009 06 01	Tontogany Creek	45.3	3	5	3x	0	4	2015
04100010 02 03	Town of Bloomdale-South Branch Portage River	53.57	3i	4Ah	5	3i	4	2021
04100010 06 01	Upper Tousant Creek	74	5h	5	4Ah	0	4	2017
04100011 08 06	Lower Honey Creek	35.56	3	5	1ht	0	4	2019
04100011 09 03	Greasy Run-Sycamore Creek	23.99	3	5	4Ah	0	4	2019
04110001 01 05	City of Medina-West Branch Rocky River	26.37	1	5	1	0	4	2029
04110001 01 06	Cossett Creek-West Branch Rocky River	41.44	1	5	4n	0	4	2029
04110001 02 01	Headwaters East Branch Rocky River	40.56	1	5	1	0	4	2029
04110001 06 02	Black River	35.38	5	4A	5	0	4	2027
04110001 07 02	Mouth Beaver Creek	25.44	3	5	4C	0	4	2015
04110003 01 04	Middle Ashtabula River	30.35	1h	5	1	0	4	2026
04110003 03 01	Silver Creek	13.83	3	5h	1t	0	4	2021
04110003 03 03	McFarland Creek-Aurora Branch	20.42	3	5	4A	0	4	2021
04110003 03 04	Beaver Creek-Chagrin River	47.48	3	5	4A	0	4	2021
04120101 06 06	Town of North Kingsville-Frontal Lake Erie	23.57	3	5	3	0	4	2015
05030101 06 06	Leslie Run-Bull Creek	20.15	5h	5	4Ah	0	4	2020
05030101 07 03	Upper North Fork	19.17	5h	5h	1	0	4	2020
05030101 08 04	Hollow Rock Run-Yellow Creek	39.29	5	5h	4A	0	4	2020
05030102 03 01	Headwaters Pymatuning Creek	60.96	3	5h	4n	0	4	2023
05030102 03 03	Stratton Creek-Pymatuning Creek	19.31	3	5h	4n	0	4	2023
05030103 02 02	Willow Creek	20.02	5h	4Ah	4A	0	4	2022
05030103 03 02	Headwaters West Branch Mahoning River	31.11	5h	4Ah	5	0	4	2022
05030103 03 04	Kirwin Reservoir-West Branch Mahoning River	37.29	5	4Ah	5	1	4	2022
05030103 05 01	Upper Mosquito Creek	25.85	3	5	4n	0	4	2028

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05030103 06 01	Duck Creek	33.24	3	5	5	0	4	2028
05030103 06 02	Mud Creek	14.19	3	5	5	0	4	2028
05030103 07 02	Middle Meander Creek	32.34	3	5	4n	0	4	2028
05030103 07 05	Little Squaw Creek-Mahoning River	26.14	3	5	4C	0	4	2028
05030103 08 01	Headwaters Mill Creek	37.05	3	5	5	0	4	2028
05030103 08 02	Indian Run	14.28	3	5	5	0	4	2028
05030103 08 03	Andersons Run-Mill Creek	27.11	1	5	5	0	4	2028
05030103 08 09	Coffee Run-Mahoning River	49.56	3	5	5h	0	4	2028
05030106 02 03	North Fork Short Creek	22.16	3	5h	5	0	4	2025
05030106 02 05	Perrin Run-Short Creek	26.22	3	5h	1	0	4	2025
05030106 07 02	Upper McMahon Creek	38.11	3	5h	1	0	4	2024
05030106 12 04	Glenns Run-Ohio River	31.29	3	5	5	0	4	2025
05030201 06 01	Rich Fork	22.41	3	5	1h	0	4	2015
05030201 06 02	Cranenest Fork	26.31	3	5	1h	0	4	2015
05030201 06 04	Witten Fork	42.36	3	5	1h	0	4	2015
05030201 06 05	Straight Fork-Little Muskingum River	36.7	3i	5	1h	0	4	2015
05030201 07 02	Archers Fork	18.55	3	5	1h	0	4	2015
05030201 09 01	Headwaters West Fork Duck Creek	74.68	1h	5	4Ah	1	4	2020
05030201 10 06	Mill Creek-Ohio River	43.28	3	5	3i	0	4	2024
05030202 01 03	Headwaters Little Hocking River	35.55	3	5	3x	0	4	2015
05030202 01 04	West Branch Little Hocking River	39.45	3	5	3x	0	4	2015
05030202 01 05	Little West Branch Little Hocking River-Little Hocking River	27.31	3	5	3x	0	4	2015
05030202 02 02	Kingsbury Creek	21.45	3	5	3x	0	4	2015
05030202 02 03	Headwaters Middle Branch Shade River	40.09	3	5	3x	0	4	2015
05030202 02 05	Walker Run-West Branch Shade River	27.69	3	5	3x	0	4	2015
05030202 03 04	Spruce Creek-Shade River	18.8	5h	5	3x	0	4	2015
05030202 07 04	Little Leading Creek	25.51	3	5h	4A	0	4	2018
05030204 05 03	Snow Fork	27.28	3	5h	4Ah	0	4	2019
05030204 10 01	Willow Creek-Hocking River	31.64	1	5	4Ah	0	4	2019

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05040001 02 03	Little Chippewa Creek	32.16	5h	5	4Ah	0	4	2017
05040001 13 02	Headwaters Stillwater Creek	13.58	3	5	1	0	4	2027
05040001 15 01	Clear Fork	24.98	3	5	5	0	4	2027
05040002 03 02	Cedar Fork	47.69	3	5h	1	0	4	2023
05040002 04 02	Possum Run	15.62	3	5h	1	0	4	2023
05040002 06 03	Katotawa Creek	13.53	3	5h	1	0	4	2023
05040002 06 04	Oldtown Run	23.12	3	5h	1	0	4	2023
05040002 08 05	Negro Run-Mohican River	28.64	3	5h	1	0	4	2023
05040003 01 02	East Branch Kokosing River	31.58	1h	5h	1	0	4	2022
05040003 03 02	Armstrong Run-Kokosing River	17.06	3	5	1	0	4	2022
05040003 05 03	Rathburn Run-Little Killbuck Creek	20.97	3	5h	1	0	4	2024
05040003 06 03	Shreve Creek	15.98	3	5	5	0	4	2024
05040003 06 06	Salt Creek	27.17	3	5h	1	0	4	2024
05040004 04 04	Buckeye Fork	23.3	3i	1h	5	0	4	2023
05040004 07 04	Fourmile Run-Meigs Creek	33.31	3	5	1	0	4	2028
05040004 08 02	Flat Run-Muskingum River	19.31	3i	5h	1	0	4	2028
05040004 08 04	Island Run	13.52	3	5h	4n	0	4	2028
05040004 08 07	Bald Eagle Run	10.94	3	5	1	0	4	2028
05040004 08 08	Bell Creek-Muskingum River	25.1	3	5	1	0	4	2028
05040004 08 09	Olney Run-Muskingum River	22.19	3	5	1	0	4	2028
05040004 11 01	Headwaters Olive Green Creek	30.52	3	5	1	0	4	2028
05040004 11 02	Keith Fork	15.03	3	5	1	0	4	2028
05040004 11 03	Little Olive Green Creek	18.12	3	5	1	0	4	2028
05040004 12 03	Cat Creek-Muskingum River	32.53	3	5	1	0	4	2027
05040005 01 02	Beaver Creek	23.33	3	5	5	0	4	2029
05040005 01 03	Glady Run-Seneca Fork	41.33	3	5	5	0	4	2029
05040005 01 05	Opossum Run-Seneca Fork	32.47	3	5	5	0	4	2029
05040005 02 02	Headwaters Collins Fork	33.92	3	5	5	0	4	2029
05040005 02 05	Crane Run-Buffalo Fork	14.04	3	5	5	0	4	2029
05040005 05 04	Sarchet Run-Wills Creek	27.2	3i	5	1	0	4	2029

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05040005 06 01	Bacon Run	15.7	1h	5	5	0	4	2029
05040006 02 01	Lake Fork Licking River	35.11	3	5h	1	0	4	2023
05040006 03 01	Headwaters Raccoon Creek	27.01	3	5	5	0	4	2023
05040006 03 03	Moots Run-Raccoon Creek	25.69	3	5h	1	0	4	2023
05040006 04 05	Town of Kirkersville-South Fork Licking River	17.16	3	5	1	0	4	2023
05040006 04 07	Ramp Creek	16.84	3	5h	1	0	4	2023
05040006 05 03	Rocky Fork	55.52	1	5	1	0	4	2023
05040006 06 01	Brushy Fork	18.32	3	5h	1	0	4	2023
05060001 01 01	Cottonwood Ditch	19.52	3	5	1	0	4	2024
05060001 01 03	Taylor Creek	16.85	3	5h	1	0	4	2024
05060001 04 04	Wildcat Creek	22.43	5h	5h	5	0	4	2024
05060001 05 01	Patton Run	15.79	3	5h	5	0	4	2024
05060001 05 03	Kebler Run	14.32	3	5h	1	0	4	2024
05060001 07 01	Headwaters Bokes Creek	35.69	3	5	4A	0	4	2028
05060001 07 02	Brush Run-Bokes Creek	20.27	3i	5	4A	0	4	2028
05060001 12 01	Eversole Run	13.66	3i	5h	1	0	4	2025
05060001 12 02	O'Shaughnessy Dam-Scioto River	16.72	1	5h	3	0	4	2025
05060001 12 03	Indian Run	17.32	3	5h	5	0	4	2025
05060001 18 05	Big Run-Walnut Creek	51.59	1	5h	4A	0	4	2020
05060001 18 06	Mud Run-Walnut Creek	13.7	5h	5	1t	0	4	2020
05060001 21 02	Silver Ditch-Big Darby Creek	17.2	1	5	1	0	4	2029
05060001 23 03	Grant Run-Scioto River	43.58	3	5h	5	0	4	2025
05060002 01 05	Oak Run	26.77	3	5	1	0	4	2026
05060002 01 06	Turkey Run-Deer Creek	32.54	1	5	1	0	4	2026
05060002 02 02	Sugar Run	23.02	3	5	5	0	4	2026
05060002 02 04	Town of Mount Sterling-Deer Creek	31.42	1	5	1	0	4	2026
05060002 02 06	Buskirk Creek	18.67	3	5	5	0	4	2026
05060002 03 04	State Run-Deer Creek	31.25	3i	5	1	0	4	2026
05060002 05 03	Lick Run-Scioto River	26.95	3i	5	3i	0	4	2026
05060002 07 02	Middle Fork Salt Creek	62.73	3	5h	4A	0	4	2021

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05060002 08 03	Horse Creek-Little Salt Creek	23.03	3i	5	4A	1	4	2021
05060002 09 01	East Fork Queer Creek	13.85	5h	5h	1	0	4	2021
05060002 09 05	Village of Eagle Mills-Salt Creek	16.91	5h	5h	1	0	4	2021
05060002 10 01	Indian Creek	23.36	5h	5	1	0	4	2026
05060002 11 02	Left Fork Crooked Creek	17.75	3	5	4n	0	4	2026
05060002 11 03	Crooked Creek	25.08	3	5	1	0	4	2026
05060002 12 01	Headwaters Sunfish Creek	36.02	3	5	1	0	4	2026
05060002 12 04	Grassy Fork-Sunfish Creek	18.39	3	5	1	0	4	2026
05060002 12 05	Chenoweth Fork	29.85	3	5	1	0	4	2026
05060002 14 01	Churn Creek	17.87	3	4Ah	5	0	4	2021
05060002 15 01	Headwaters Scioto Brush Creek	30.4	3	4Ah	5	0	4	2021
05060002 15 07	Duck Run-Scioto Brush Creek	26.85	3	4Ah	5	0	4	2021
05060002 16 01	Camp Creek	32.03	3	5	1	0	4	2026
05060002 16 04	Pond Creek	26.05	3	5	4n	0	4	2026
05060003 05 02	Clear Creek	45.29	1h	4A	5	3i	4	2022
05080001 05 03	Lake Loramie-Loramie Creek	41.16	1	4A	5	0	4	2023
05080001 07 01	Leatherwood Creek	16.94	3	5h	1	0	4	2024
05080001 07 02	Mosquito Creek	38.3	1	5h	4C	3i	4	2024
05080001 07 03	Brush Creek-Great Miami River	30.19	3	5h	3i	0	4	2024
05080001 08 02	Headwaters Lost Creek	14.1	3	5h	1	0	4	2024
05080001 09 06	Town of Beamsville-Stillwater River	19.62	1h	5	4A	0	4	2028
05080001 10 03	West Branch Greenville Creek	25.82	3	5	1d	0	4	2028
05080001 12 02	Swamp Creek	43.32	1h	5	4A	0	4	2028
05080001 12 05	Town of Covington-Stillwater River	21.66	1	5	4A	0	4	2028
05080001 13 03	Canyon Run-Stillwater River	44.99	3	5	3it	0	4	2028
05080001 14 03	Brush Creek	16.41	3	5	1d	0	4	2028
05080001 14 06	Town of Irvington-Stillwater River	26.23	3	5h	3it	0	4	2028
05080001 16 06	Chapman Creek	24.26	5h	3	5	0	4	2018
05080001 19 03	Huffman Dam-Mad River	28.59	3	5h	3iht	0	4	2018
05080001 20 01	East Fork Honey Creek	13	3	5h	1	0	4	2024

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05080001 20 02	West Fork Honey Creek	20.91	3	5h	1	0	4	2024
05080001 20 03	Indian Creek	25.85	3	5h	1	0	4	2024
05080002 01 03	Dry Run-Wolf Creek	23.68	1	5h	1	0	4	2025
05080002 04 03	Clear Creek	53.01	3	5	1	0	4	2025
05080003 07 02	Headwaters East Fork Whitewater River	33.04	3	5	3x	0	4	2017
05080003 07 04	Rocky Fork-East Fork Whitewater River	15.34	3	5	3x	0	4	2017
05090101 02 04	Twomile Run-Raccoon Creek	16.31	3	3	5	0	4	2016
05090101 02 05	Town of Zaleski-Raccoon Creek	42.94	1h	3	5	0	4	2016
05090101 03 01	Hewett Fork	40.57	3	3	5	0	4	2016
05090103 01 01	Solida Creek-Ohio River	34.25	3	5h	5	0	4	2025
05090103 01 06	Ginat Creek	13.57	3	5h	5	0	4	2025
05090103 01 07	Grays Branch-Ohio River	33.89	3	5h	3i	0	4	2025
05090103 02 04	Howard Run-Pine Creek	38.7	1	5h	1	0	4	2025
05090103 06 01	Headwaters Rocky Fork	26.24	3	5h	4n	0	4	2025
05090103 06 03	McConnel Creek-Rocky Fork	24.71	1	5	1	0	4	2025
05090201 02 03	Pond Run	12.18	3	3	5hx	0	4	2016
05090201 02 04	Briery Branch-Ohio River	35.94	3	3	5hx	0	4	2016
05090201 02 05	Upper Twin Creek	17.27	3	3	5hx	0	4	2016
05090201 02 06	Lower Twin Creek	16.04	3	3	5hx	0	4	2016
05090201 02 07	Rock Run-Ohio River	19.16	3	3	5hx	0	4	2016
05090201 02 09	Stout Run	14.1	3	3	5hx	0	4	2016
05090201 02 10	Quicks Run-Ohio River	46.66	3	3	5hx	0	4	2016
05090201 03 03	Baker Fork	43.97	3	5h	5	0	4	2022
05090201 05 05	Beasley Fork	18.22	3	5	1	0	4	2022
05090202 02 03	Massies Creek	34.51	5h	5	1d	0	4	2026
05090202 03 01	Headwaters Anderson Fork	35.74	3	5	5	0	4	2026
05090202 09 02	O'Bannon Creek	59.34	3	5	4n	0	4	2022
05090202 10 03	Headwaters Dodson Creek	16.12	1h	3	5	0	4	2027
05120103 01 01	Little Mississinewa River	20.9	3	3	5hx	0	4	2022
05120103 01 02	Gray Branch-Mississinewa River	31.75	3	3	5hx	0	4	2022

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05120103 01 03	Jordan Creek-Mississinewa River	25.79	3	3	5hx	0	4	2022
05080001 90 02	Stillwater River Mainstem (Greenville Creek to mouth)	676	1	5	4C	0	4	2028
05090202 90 02	Little Miami River Mainstem (O'Bannon Creek to Ohio River)	1757	5	4A	5	0	4	2022
04100003 01 06	Clear Fork-East Branch St Joseph River	49.95	1	5	4n	0	3	2028
04100003 04 02	Headwaters Fish Creek	13.86	3	5	1	0	3	2028
04100003 04 06	Cornell Ditch-Fish Creek	24.72	3i	5	1	0	3	2028
04100004 02 02	Eightmile Creek	22.45	5h	1	5hx	0	3	2015
04100004 03 01	Little Black Creek	24.95	5h	5	3x	0	3	2015
04100004 04 01	Twentyseven Mile Creek	28.7	3	5	3x	0	3	2015
04100006 02 05	Stag Run-Bean Creek	14.45	3	5	1	0	3	2028
04100006 03 02	Leatherwood Creek	17.34	5h	1	5	0	3	2028
04100006 04 04	Lower Lick Creek	17.39	3i	5	1	0	3	2028
04100006 05 04	Coon Creek-Tiffin River	30.21	3	5	4n	0	3	2028
04100007 10 02	Upper Blue Creek	25.53	3	5	1	0	3	2029
04100007 12 01	Headwaters Flatrock Creek	24.55	3	5	1	0	3	2029
04100007 12 08	Sixmile Creek	28.31	3	5	1	0	3	2029
04100007 12 09	Eagle Creek-Auglaize River	34.27	3i	5	5	3i	3	2029
04100008 02 03	Findlay Upground Reservoirs-Blanchard River	22.5	5h	4Ah	4A	3i	3	2020
04100009 05 06	Lower Yellow Creek	22.67	3	1	5hx	0	3	2015
04100009 05 10	Lick Creek-Maumee River	23.39	3	3	5hx	0	3	2015
04100010 05 02	Portage River	48.86	5	4A	5	0	3	2021
04100011 01 03	Mills Creek	42.17	3i	5	4A	3i	3	2024
04100011 04 03	Headwaters Middle Sandusky River	37.44	5h	4A	4Ah	3	3	2019
04100011 08 05	Middle Honey Creek	41.31	3	5	4Ah	3	3	2019
04100011 14 03	Little Muddy Creek	28.58	3	5h	4A	0	3	2024
04100012 01 01	Clear Creek-Vermilion River	22.22	5h	3	5h	0	3	2021
04100012 01 02	Buck Creek	20.88	5h	3	5h	0	3	2021
04100012 02 01	East Branch Vermilion River	37.52	5h	3	5h	0	3	2021
04110001 03 01	East Fork of East Branch Black River	14.17	5h	4A	5d	0	3	2027

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04110001 05 02	Upper West Branch Black River	40.13	5h	4A	4A	0	3	2027
04110001 05 05	Plum Creek	13.81	5h	4A	5d	0	3	2027
04110001 07 01	Headwaters Beaver Creek	19.38	3	5	3x	0	3	2015
04110002 03 04	City of Akron-Little Cuyahoga River	19.66	5h	5	4A	0	3	2018
04110004 01 03	Baughman Creek	18.44	5h	4Ah	4n	0	3	2019
05030101 05 02	Headwaters West Fork Little Beaver Creek	17.82	3	5	4Ah	0	3	2020
05030101 06 05	Headwaters Bull Creek	18.29	5h	5	4Ah	0	3	2020
05030101 10 03	Middle Cross Creek	14.49	5h	5h	1	0	3	2025
05030103 01 02	Beech Creek	31.64	3	4A	5	0	3	2022
05030103 01 03	Fish Creek-Mahoning River	56.7	5	4A	5	1	3	2022
05030103 02 03	Mill Creek	32.42	5h	4Ah	5	0	3	2022
05030103 02 04	Island Creek-Mahoning River	29.05	5	4A	5	3	3	2022
05030103 03 01	Kale Creek	25.52	5h	4Ah	5	0	3	2022
05030103 07 01	Upper Meander Creek	23.09	3	5	4n	0	3	2028
05030103 08 04	Crab Creek	21.07	3	5	1	0	3	2028
05030103 08 07	Dry Run-Mahoning River	25.38	3	5	4n	3	3	2028
05030106 03 02	Headwaters Wheeling Creek	25.52	5h	1	5	0	3	2025
05030106 07 03	Little McMahon Creek	14.92	3	1h	5	1	3	2024
05030106 09 03	Bend Fork	27.02	3	5	1	0	3	2024
05030201 07 04	Fifteen Mile Creek	20.52	3	5	1h	0	3	2015
05030202 01 02	Mile Run-Ohio River	40.28	3	5	3x	0	3	2015
05030202 01 06	Sandy Creek-Ohio River	40.07	3	5	3x	0	3	2015
05030202 02 04	Elk Run-Middle Branch Shade River	17.57	3	5	3x	0	3	2015
05030202 07 01	Headwaters Leading Creek	13.37	3	5h	4A	0	3	2018
05030202 08 03	Oldtown Creek-Ohio River	29.66	1h	5	3x	0	3	2015
05030204 04 02	Baldwin Run	12.61	5h	4A	5	0	3	2019
05040001 04 01	Conser Run	15.51	5h	5h	4n	0	3	2025
05040001 04 02	Middle Branch Sandy Creek	15.57	5h	5h	1	0	3	2025
05040001 04 03	Pipes Fork-Still Fork	34.81	5h	5h	1	0	3	2025
05040001 05 02	East Branch Nimishillen Creek	46.62	5h	4A	5	0	3	2017

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05040001 05 03	West Branch Nimishillen Creek	46.69	5h	4A	5	0	3	2017
05040001 05 04	City of Canton-Middle Branch Nimishillen Creek	26.02	5h	4Ah	5	0	3	2017
05040001 05 05	Sherrick Run-Nimishillen Creek	22.75	5h	4Ah	5	0	3	2017
05040001 14 02	Brushy Fork	70.03	1	5	5	0	3	2027
05040001 15 05	Lower Little Stillwater Creek	14.69	3	1	5	0	3	2027
05040001 16 02	Crooked Creek	18.97	3	5	1	0	3	2027
05040002 01 04	Whetstone Creek	17.14	3	5h	1	0	3	2023
05040002 02 05	Charles Mill-Black Fork Mohican River	8.97	5h	1h	5	0	3	2023
05040002 05 01	Upper Muddy Fork Mohican River	28.59	3	5	4C	0	3	2023
05040002 06 01	Lang Creek	34.13	3	5h	1	0	3	2023
05040002 06 02	Orange Creek	37.52	3	5h	1	0	3	2023
05040002 08 01	Honey Creek	17.32	3	5h	1	0	3	2023
05040003 02 03	Granny Creek-Kokosing River	25.6	3i	5h	1	0	3	2022
05040003 03 03	Big Run	31.06	3	5h	1	0	3	2022
05040003 03 06	Schenck Creek	24.99	3	5h	1	0	3	2022
05040003 05 02	Little Killbuck Creek-Killbuck Creek	33.58	3	1	5	0	3	2024
05040003 07 04	Black Creek	35.24	3	5h	1	0	3	2024
05040003 08 01	Wolf Creek	26.74	3	5h	1	0	3	2024
05040003 08 03	Bucks Run-Doughty Creek	28.14	3	5h	1	0	3	2024
05040003 09 01	Mohawk Creek	25.58	3	5h	1	1	3	2025
05040003 09 02	Dutch Run-Walhonding River	15.85	3	5h	1	0	3	2025
05040003 09 05	Darling Run-Walhonding River	15.95	3	5h	4n	0	3	2025
05040004 03 03	North Branch Symmes Creek	14.92	3	5h	1	0	3	2025
05040004 08 01	Brush Creek	24.97	3	5h	5	0	3	2028
05040004 09 01	South West Branch Wolf Creek	22.11	3	5	1	0	3	2028
05040004 10 01	Headwaters West Branch Wolf Creek	55.48	3	5	4n	0	3	2028
05040004 10 02	Aldridge Run-West Branch Wolf Creek	35.07	3	5	1	0	3	2028
05040004 12 04	Devol Run-Muskingum River	20.7	3	5	4n	0	3	2027
05040005 02 01	Yoker Creek	23.25	3	5	1	0	3	2029
05040005 03 02	Hawkins Run-Leatherwood Creek	56.58	3	5	1	0	3	2029

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05040005 04 01	Brushy Fork	19.75	3	5	1	0	3	2029
05040005 04 03	Clear Fork	15.51	3	5	1	0	3	2029
05040005 04 04	Rocky Fork	20.34	3	5	1	0	3	2029
05040005 04 05	Salt Fork Lake-Sugartree Fork	26.37	3i	5	1	0	3	2029
05040005 05 05	Indian Camp Run	18.41	3	5	1	0	3	2029
05040005 05 06	Headwaters Birds Run	14.35	3	5	1	0	3	2029
05040005 06 03	White Eyes Creek	43.7	1h	5	5	0	3	2029
05040006 01 03	Sycamore Creek	30.66	3	5h	1	0	3	2023
05040006 03 04	Salt Run-Raccoon Creek	30.93	3	5	1	0	3	2023
05040006 04 01	Muddy Fork	14.01	3	5h	5	0	3	2023
05040006 04 02	Headwaters South Fork Licking River	15.43	3	5h	1	0	3	2023
05040006 04 08	Dutch Fork	21.76	3	5h	1	0	3	2023
05040006 05 02	Lost Run	22.98	5h	5h	1	0	3	2023
05040006 06 02	Big Run	25.08	1h	5h	3i	0	3	2023
05060001 04 02	Panther Creek	23.15	5h	1h	5	0	3	2024
05060001 06 01	Upper Mill Creek	34.85	3	5	1d	0	3	2027
05060001 07 03	Smith Run-Bokes Creek	27.64	3i	5	4A	0	3	2028
05060001 21 01	Worthington Ditch-Big Darby Creek	58.86	1	5	1d	0	3	2029
05060001 22 01	Hellbranch Run	38.27	1h	5	4A	0	3	2029
05060002 01 01	Headwaters Deer Creek	17.13	3	5	1	0	3	2026
05060002 01 02	Richmond Ditch-Deer Creek	32.64	1	5	4C	0	3	2026
05060002 02 03	Opossum Run	19.5	3	5	1	0	3	2026
05060002 03 01	Dry Run	20.8	3	5	3i	0	3	2026
05060002 03 02	Hay Run	29.1	3	5	4n	0	3	2026
05060002 04 06	Blackwater Creek-Scioto River	23.94	3	5	5	0	3	2026
05060002 05 02	Dry Run-Scioto River	33.94	3	5	3i	0	3	2026
05060002 10 02	Dry Run	17.25	5h	5	4n	0	3	2026
05060002 13 02	Headwaters Big Beaver Creek	39.93	3	5	1	0	3	2026
05060002 15 04	Dunlap Creek-Scioto Brush Creek	28.75	3	4Ah	5	0	3	2021
05060002 15 05	Bear Creek	19.17	3	4Ah	5	0	3	2021

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05060003 04 06	Fall Creek	15.12	3	1h	5	0	3	2022
05080001 07 04	Rush Creek	18.78	3	5h	4n	0	3	2024
05080001 09 01	South Fork Stillwater River	13.93	1h	5	4A	0	3	2028
05080001 09 05	Woodington Run-Stillwater River	33.86	1h	5	1d	0	3	2028
05080001 10 01	Dismal Creek	19.23	3i	5	4C	0	3	2028
05080001 10 02	Kraut Creek	22.54	3	5	1d	0	3	2028
05080001 10 04	Headwaters Greenville Creek	34.62	1	5	4n	0	3	2028
05080001 11 02	Bridge Creek-Greenville Creek	20.27	1	5	4n	3	3	2028
05080001 12 01	Indian Creek	19.92	1h	5	4A	0	3	2028
05080001 12 03	Trotters Creek	18.8	1h	5	4A	0	3	2028
05080001 14 04	Jones Run-Stillwater River	17.15	3	5	1d	0	3	2028
05080002 03 04	Town of Gratis-Twin Creek	33.01	1h	5	1	0	3	2019
05080002 04 01	Headwaters Bear Creek	32.37	3	5h	1	0	3	2025
05080002 07 03	Shaker Creek	21.44	5h	3	5h	0	3	2025
05080002 09 04	Dry Run-Great Miami River	28.84	3	3	5h	0	3	2025
05090101 02 03	Brushy Fork	33.67	3	3	5hx	0	3	2016
05090101 03 02	Headwaters Elk Fork	43.8	3	3	5	0	3	2016
05090101 04 03	Meadow Run-Little Raccoon Creek	39.36	3	1	5	0	3	2016
05090101 05 02	Strongs Run	17.35	3	3	5hx	0	3	2016
05090101 05 03	Flatlick Run-Raccoon Creek	43.17	3	3	5hx	0	3	2016
05090101 05 04	Robinson Run-Raccoon Creek	21.74	3	3	5hx	0	3	2016
05090101 06 01	Indian Creek	21.83	3	3	5hx	0	3	2016
05090101 06 02	Barren Creek-Raccoon Creek	22.12	3	3	5hx	0	3	2016
05090101 06 03	Mud Creek-Raccoon Creek	38.8	3	3	5hx	0	3	2016
05090101 06 04	Bullskin Creek	14.44	3	3	5hx	0	3	2016
05090101 08 02	Black Fork	49.38	3	5	3x	0	3	2016
05090103 02 05	Lick Run-Pine Creek	50.28	1	1	5	0	3	2025
05090103 05 01	Headwaters Little Scioto River	20.21	3	5h	1	0	3	2025
05090103 05 04	McDowell Creek-Little Scioto River	38.41	1	5h	1	0	3	2025
05090201 11 06	Bear Creek-Ohio River	55.7	3i	5	1	0	3	2029

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05090201 12 04	Ferguson Run-Twelvemile Creek	19.51	3	5	4n	0	3	2029
05090202 03 03	Mouth Anderson Fork	16.94	3i	5	4n	0	3	2026
05090202 04 01	North Branch Caesar Creek	26.72	1h	5	4n	0	3	2026
05090202 04 02	Upper Caesar Creek	13.57	1h	5	4n	0	3	2026
05090202 11 03	Todd Run-East Fork Little Miami River	23.27	1	3	5	0	3	2027
05090202 12 01	Poplar Creek	24.68	1h	3	5	0	3	2027
05090202 13 02	Brushy Fork	14.92	1h	3	5	0	3	2027
05090202 13 03	Moores Fork-Stonelick Creek	19.37	1h	5	5	0	3	2027
05090202 13 04	Lick Fork-Stonelick Creek	18.31	1	5	1	0	3	2027
05090202 14 05	Dry Run-Little Miami River	17.78	3	3	5d	0	3	2022
05090203 01 02	West Fork Mill Creek	36.21	5h	1	5	0	3	2029
05090203 01 04	Congress Run-Mill Creek	29.96	5h	3	5	0	3	2029
05090203 01 05	West Fork-Mill Creek	23.62	5	3	5	0	3	2029
04100008 90 01	Blanchard River Mainstem (Dukes Run to mouth)	771	5	3	1	3i	3	2020
04100011 90 01	Sandusky River Mainstem (Tymochtee Creek to Wolf Creek)	1073	5	4Ah	4A	3i	3	2024
04100003 05 06	Sol Shank Ditch-St Joseph River	27.28	5h	3	3	0	2	2028
04100006 06 04	Buckskin Creek-Tiffin River	20.96	5h	1	4n	0	2	2028
04100007 01 01	Headwaters Auglaize River	42.4	5h	4Ahx	1ht	0	2	2018
04100007 01 02	Blackhoof Creek	16.3	5h	4Ahx	4Ah	0	2	2018
04100007 01 03	Wrestle Creek-Auglaize River	29.88	5h	4Ahx	4Ah	0	2	2018
04100007 01 04	Pusheta Creek	34.65	5h	4Ahx	1ht	0	2	2018
04100007 02 01	Two Mile Creek	31.72	5h	4Ahx	4Ah	0	2	2018
04100007 03 01	Upper Hog Creek	21.68	5h	3	1	0	2	2025
04100007 03 02	Middle Hog Creek	30.44	5h	4A	1	0	2	2025
04100007 03 03	Little Hog Creek	22.23	5h	4A	4A	0	2	2025
04100007 03 04	Lower Hog Creek	16.11	5h	4A	4A	0	2	2025
04100007 04 01	Little Ottawa River	16.42	5h	4A	4A	0	2	2025
04100007 04 04	Pike Run	13.24	5h	4A	1	0	2	2025
04100007 04 05	Leatherwood Ditch	13.46	5h	4A	1	0	2	2025

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04100007 04 06	Beaver Run-Ottawa River	20.84	5h	4A	1	0	2	2025
04100007 05 01	Sugar Creek	64.14	5h	4A	1	0	2	2025
04100007 05 03	Village of Kalida-Ottawa River	20.58	5h	4A	1	0	2	2025
04100007 06 03	Wolf Ditch-Little Auglaize River	21.2	1	5	1	0	2	2029
04100007 07 02	West Branch Prairie Creek	50.54	1	5	1	0	2	2029
04100007 09 01	Upper Jennings Creek	26.99	5h	4Ahx	1ht	0	2	2018
04100007 09 02	West Jennings Creek	13.95	5h	4Ahx	1ht	0	2	2018
04100007 09 03	Lower Jennings Creek	28.13	5h	4A	4Ah	0	2	2018
04100007 09 06	Prairie Creek	13.8	5h	4Ahx	4Ah	0	2	2018
04100008 01 01	Cessna Creek	23.21	5h	4Ah	4A	0	2	2020
04100008 01 02	Headwaters Blanchard River	19.66	5h	4Ah	4A	0	2	2020
04100008 01 03	The Outlet-Blanchard River	34.1	5h	4Ah	4A	0	2	2020
04100008 01 04	Potato Run	27.85	5h	4Ah	4A	0	2	2020
04100008 01 05	Ripley Run-Blanchard River	36.94	5h	4A	4A	0	2	2020
04100008 02 01	Brights Ditch	28.45	5h	4Ah	3i	0	2	2020
04100008 02 02	The Outlet	38.36	5h	4Ah	1	0	2	2020
04100008 02 04	Lye Creek	27.56	5h	4Ah	4A	0	2	2020
04100008 03 01	Upper Eagle Creek	26.37	5h	4Ah	4A	0	2	2020
04100008 03 02	Lower Eagle Creek	34.01	5h	4A	4A	0	2	2020
04100008 03 03	Aurand Run	18.03	5h	4Ah	1	0	2	2020
04100008 03 04	Howard Run-Blanchard River	36.28	5	4A	4A	0	2	2020
04100008 05 01	Tiderishi Creek	19.17	5h	4Ah	4A	0	2	2020
04100008 05 02	Ottawa Creek	44.92	5h	4Ah	4A	0	2	2020
04100008 05 03	Moffitt Ditch	13.54	5h	4Ah	4A	0	2	2020
04100008 05 04	Dukes Run	15.02	5h	4Ah	4A	0	2	2020
04100008 05 05	Dutch Run	14.76	5h	4Ah	1	0	2	2020
04100009 01 05	Little Turkeyfoot Creek	23.12	3	5	5hx	0	2	2015
04100009 08 04	Heilman Ditch-Swan Creek	36.88	5	4Ah	4A	0	2	2017
04100010 02 04	Rhodes Ditch-South Branch Portage River	20.66	5	4Ah	1	0	2	2021
04100010 03 02	Town of Pemberville-Portage River	18.06	5h	4Ah	1	0	2	2021

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04100010 04 01	Sugar Creek	59.39	5h	4A	4A	0	2	2021
04100010 04 02	Larcarpe Creek Outlet #4-Portage River	27.89	5h	4A	4A	0	2	2021
04100010 05 01	Little Portage River	32.63	5h	4Ah	4A	0	2	2021
04100010 06 02	Packer Creek	34.49	5h	3	4Ah	0	2	2017
04100010 06 03	Lower Toussaint Creek	30.67	5	3	4Ah	0	2	2017
04100011 04 01	Headwaters Paramour Creek-Sandusky River	27.95	5h	4A	4Ah	0	2	2019
04100011 04 02	Loss Creek-Sandusky River	24.26	5h	4Ahx	4A	0	2	2019
04100011 04 04	Grass Run	24.52	5h	4Ahx	4Ah	0	2	2019
04100011 04 05	Headwaters Lower Sandusky River	24.07	5h	4Ahx	4Ah	0	2	2019
04100011 06 04	Spring Run	29.94	3	5	4Ah	0	2	2019
04100011 06 05	Mouth Tymochtee Creek	26.11	1h	5	4Ah	0	2	2019
04100011 07 02	Town of Upper Sandusky-Sandusky River	29.07	5h	4A	4Ah	3i	2	2019
04100011 07 03	Negro Run	13.66	5h	4Ahx	1ht	0	2	2019
04100011 07 04	Cranberry Run-Sandusky River	21.38	5h	4Ahx	4Ah	0	2	2019
04100011 07 05	Sugar Run-Sandusky River	18.69	5h	4Ahx	4Ah	0	2	2019
04100011 14 04	Town of Lindsey-Muddy Creek	24.12	5	4Ah	4A	0	2	2024
04100012 03 04	Old Woman Creek	26.49	3	5	4Ah	0	2	2021
04100012 05 03	Frink Run	29.77	3i	3	4Ah	3i	2	2016
04100012 06 06	Huron River-Frontal Lake Erie	44.81	5	4A	4Ah	0	2	2016
04110001 01 04	Mallet Creek	18.04	5h	1	1	0	2	2029
04110001 02 04	Cahoon Creek-Frontal Lake Erie	38.43	3	5	5	0	2	2029
04110001 04 03	Willow Creek	22.58	5h	4A	4A	0	2	2027
04110001 04 04	Jackson Ditch-East Branch Black River	33.63	5	4A	4C	0	2	2027
04110001 05 04	Middle West Branch Black River	25.68	5h	4A	4A	0	2	2027
04110001 05 06	Lower West Branch Black River	39.18	5	4A	4A	3	2	2027
04110002 01 03	Tare Creek-Cuyahoga River	22.92	5h	1	4Ah	0	2	2018
04110002 01 04	Ladue Reservoir-Bridge Creek	38.79	5	1h	4Ah	5	2	2018
04110002 04 02	Yellow Creek	31.21	5h	4A	4A	0	2	2018
04110002 04 03	Furnace Run	20.3	5h	4A	4A	0	2	2018
04110002 04 04	Brandywine Creek	27.06	5h	4Ahx	4Ah	0	2	2018

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04110002 04 05	Boston Run-Cuyahoga River	46.44	5	4Ax	4A	0	2	2018
04110002 05 03	Headwaters Chippewa Creek	17.82	5h	3	4Ah	0	2	2018
04110003 05 04	Doan Brook-Frontal Lake Erie	45.29	3	5	5	0	2	2015
04110004 01 01	Dead Branch	24.17	5h	4Ah	3i	0	2	2019
04110004 01 02	Headwaters Grand River	33.21	5h	4A	4A	1	2	2019
04110004 01 06	Swine Creek	31	5h	4Ah	1	0	2	2019
04110004 02 01	Upper Rock Creek	26.02	5h	4Ah	3i	0	2	2019
04110004 02 03	Lower Rock Creek	23.56	5h	1d	4A	0	2	2019
04110004 03 01	Phelps Creek	29.36	5h	4Ah	4n	0	2	2019
04110004 03 02	Hoskins Creek	26.87	5h	4Ah	4A	0	2	2019
04110004 03 03	Mill Creek-Grand River	35.81	5h	4A	4A	0	2	2019
04110004 03 04	Mud Creek	21.07	5h	4Ah	4A	0	2	2019
04110004 03 05	Plumb Creek-Grand River	19.24	5h	4Ah	1	0	2	2019
04110004 05 01	Three Brothers Creek-Grand River	21.71	5h	4Ah	4n	0	2	2019
05030101 04 02	Headwaters Middle Fork Little Beaver Creek	41.42	5	3	4Ah	0	2	2020
05030101 04 03	Stone Mill Run-Middle Fork Little Beaver Creek	31.65	5h	3	4Ah	3	2	2020
05030101 04 05	Elk Run-Middle Fork Little Beaver Creek	24.72	5	3	4Ah	0	2	2020
05030101 06 01	Longs Run	14.81	5h	3	4Ah	0	2	2020
05030101 06 03	Headwaters North Fork Little Beaver Creek	28.73	5h	3	1ht	0	2	2020
05030101 06 04	Little Bull Creek	17.45	5h	3	1ht	0	2	2020
05030101 06 07	Dilworth Run-North Fork Little Beaver Creek	56.95	5h	3	1ht	0	2	2020
05030101 06 08	Brush Run-North Fork Little Beaver Creek	27.52	5h	3	1ht	0	2	2020
05030101 06 09	Rough Run-Little Beaver Creek	18.11	5h	3	1ht	0	2	2020
05030101 07 01	Headwaters Yellow Creek	31.99	5h	4Ah	4A	0	2	2020
05030101 07 02	Elkhorn Creek	33.56	5h	4Ah	1	0	2	2020
05030101 07 04	Long Run-Yellow Creek	34.23	5	4Ah	4n	0	2	2020
05030101 08 01	Town Fork	25.99	1	5h	4A	0	2	2020
05030101 08 03	Salt Run-North Fork Yellow Creek	28.73	5h	4Ah	4A	0	2	2020
05030103 02 01	Deer Creek	37.56	5	4A	4A	1	2	2022
05030103 03 03	Barrel Run	12.43	5h	4Ah	4A	0	2	2022

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05030103 03 06	Charley Run Creek-Mahoning River	33.16	5	4A	4A	1	2	2022
05030103 04 01	Headwaters Eagle Creek	20.79	5h	4A	4n	0	2	2022
05030103 04 02	South Fork Eagle Creek	26.18	5h	4A	1	0	2	2022
05030103 04 03	Camp Creek-Eagle Creek	26.3	5h	4A	4A	0	2	2022
05030103 04 04	Tinkers Creek	16.48	5h	4Ah	4A	0	2	2022
05030103 05 02	Middle Mosquito Creek	71.5	1	5	1	1	2	2028
05030103 06 03	City of Warren-Mahoning River	40.38	3	5	5	0	2	2028
05030106 07 04	Lower McMahon Creek	25.77	5	1h	1	0	2	2024
05030106 09 02	South Fork Captina Creek	35.99	1	5	4n	1	2	2024
05030106 09 05	Pea Vine Creek-Captina Creek	38.02	5	1	1	0	2	2024
05030201 09 02	Buffalo Run-West Fork Duck Creek	31.8	5h	3	4Ah	0	2	2020
05030201 09 03	New Years Creek-Duck Creek	25.47	5h	3	4Ah	0	2	2020
05030201 09 04	Sugar Creek-Duck Creek	17.72	5	3	4Ah	0	2	2020
05030202 07 06	Parker Run-Leading Creek	42.91	3	5h	4A	0	2	2018
05030204 01 02	Headwaters Rush Creek	45.54	3	5	4Ah	3	2	2019
05030204 03 01	Headwaters Clear Creek	47.79	3	5h	1h	0	2	2019
05030204 03 02	Mouth Clear Creek	43.69	3i	5h	1h	0	2	2019
05030204 04 03	Pleasant Run	17.71	5h	4Ah	1ht	0	2	2019
05030204 04 04	Tarhe Run-Hocking River	20.64	5h	4A	4Ah	0	2	2019
05030204 04 05	Buck Run-Hocking River	32.05	5h	4Ah	4Ah	0	2	2019
05030204 05 01	Little Monday Creek	25.15	3	5h	4Ah	0	2	2019
05030204 05 02	Lost Run-Monday Creek	36.54	3	5h	4A	0	2	2019
05030204 05 04	Kitchen Run-Monday Creek	27.02	3	5h	4A	0	2	2019
05030204 06 02	Scott Creek	23.68	5h	1h	4Ah	0	2	2019
05030204 06 03	Oldtown Creek	13.81	5h	1h	1ht	0	2	2019
05030204 06 04	Fivemile Creek	14.22	5h	1h	4Ah	0	2	2019
05040001 01 01	Headwaters Tuscarawas River	35.82	5h	4A	4A	0	2	2017
05040001 01 02	Pigeon Creek	24.7	5h	4Ah	4Ah	0	2	2017
05040001 01 03	Hudson Run	13.76	5h	4Ah	4Ah	0	2	2017
05040001 01 05	Portage Lakes-Tuscarawas River	36.87	5	4A	4Ah	0	2	2017

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05040001 02 01	Headwaters Chippewa Creek	22.35	5h	4Ah	4A	0	2	2017
05040001 02 02	Hubbard Creek-Chippewa Creek	21.8	5h	4Ah	4Ah	0	2	2017
05040001 02 04	River Styx	29.55	5h	4A	4Ah	0	2	2017
05040001 02 05	Tommy Run-Chippewa Creek	36.68	5h	4A	4Ah	0	2	2017
05040001 02 06	Red Run	15.16	5h	4A	4Ah	0	2	2017
05040001 02 07	Silver Creek-Chippewa Creek	30.24	5h	4Ah	4Ah	0	2	2017
05040001 03 01	Pancake Creek-Tuscarawas River	22.61	5h	4A	4Ah	0	2	2017
05040001 03 03	Lake Lucern-Nimisila Creek	14.15	5h	4Ah	1ht	0	2	2017
05040001 03 04	Fox Run	14.19	5h	4Ah	4Ah	0	2	2017
05040001 03 06	Headwaters Newman Creek	24.88	5h	4A	4Ah	0	2	2017
05040001 03 07	Town of North Lawrence-Newman Creek	14.59	5h	4Ah	1ht	0	2	2017
05040001 03 08	Sippo Creek	18.09	5h	4Ah	4Ah	0	2	2017
05040001 05 01	Swartz Ditch-Middle Branch Nimishillen Creek	25.27	5h	4A	4Ah	0	2	2017
05040001 05 06	Town of East Sparta-Nimishillen Creek	20.58	5h	4A	4A	0	2	2017
05040001 14 03	Craborchard Creek-Stillwater Creek	42.84	1	5	1	0	2	2027
05040001 15 02	Standingstone Fork	16.41	3	5	5	0	2	2027
05040002 01 03	Brubaker Creek	23	3	5h	5	0	2	2023
05040002 03 01	Headwaters Clear Fork Mohican River	33.78	5	1h	3i	1	2	2023
05040002 04 05	Switzer Creek-Clear Fork Mohican River	29.37	5	1h	1	0	2	2023
05040003 05 01	Headwaters Killbuck Creek	22.18	3	5	1	0	2	2024
05040003 06 05	North Branch Salt Creek	16.45	3	5h	5	0	2	2024
05040004 01 01	Headwaters Wakatomika Creek	32.86	5h	4Ahx	1ht	0	2	2018
05040004 01 02	Winding Fork	21.38	5h	4Ahx	4Ah	3	2	2018
05040004 01 03	Brushy Fork	27.62	5h	4Ahx	4Ah	0	2	2018
05040004 02 01	Black Run-Walatomika Creek	35.44	5h	4Ahx	4Ah	0	2	2018
05040004 02 02	Mill Fork	24.25	5h	4Ahx	4Ah	0	2	2018
05040004 02 03	Little Wakatomika Creek	37.47	5h	4Ahx	4Ah	0	2	2018
05040004 03 04	South Branch Symmes Creek-Symmes Creek	17.28	3	5h	4n	0	2	2025
05040004 12 02	Rainbow Creek	18.81	3	5	1	0	2	2027
05040006 02 02	Clear Fork Licking River	22.07	3	5h	1	0	2	2023

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05040006 02 04	Dry Creek	24.6	3	5h	1	0	2	2023
05040006 04 04	Buckeye Lake Reservoir Feeder	17.23	3	5	1	0	2	2023
05040006 04 06	Bell Run-South Fork Licking River	25.98	3	5	1	0	2	2023
05060001 08 02	Mud Run	20.41	5h	4Ahx	1ht	0	2	2018
05060001 08 03	Flat Run	42.17	5h	4Ahx	1ht	0	2	2018
05060001 08 04	Town of Caledonia-Olentangy River	21.72	5h	4Ahx	4Ah	0	2	2018
05060001 09 01	Shaw Creek	29.9	5h	4Ahx	1ht	0	2	2018
05060001 10 01	Otter Creek-Olentangy River	22.86	5h	4Ahx	4Ah	0	2	2018
05060001 10 02	Grave Creek	28.83	5h	4A	4A	0	2	2018
05060001 10 04	Qu Qua Creek	16.91	5h	4Ahx	4Ah	0	2	2018
05060001 12 05	Dry Run-Scioto River	24.64	3	5h	5	0	2	2025
05060001 15 04	Town of Brice-Blacklick Creek	15.06	3	4A	5d	0	2	2020
05060001 17 01	Pawpaw Creek	17.34	5h	4Ah	4A	0	2	2020
05060001 17 03	Poplar Creek	17.43	5h	4Ah	4n	0	2	2020
05060001 17 04	Sycamore Creek	23.59	5h	4A	4A	0	2	2020
05060001 18 01	Georges Creek	14.25	5h	4Ah	4A	0	2	2020
05060001 18 03	Turkey Run	14.6	5h	4Ah	4A	0	2	2020
05060001 19 01	Headwaters Big Darby Creek	19.2	5h	4A	1d	0	2	2029
05060001 19 03	Buck Run	29.88	5h	4A	1d	0	2	2029
05060001 19 04	Sugar Run	20.48	5h	4A	4A	0	2	2029
05060001 20 01	Headwaters Treacle Creek	19.46	5h	4A	1d	0	2	2029
05060001 20 02	Proctor Run-Treacle Creek	17.43	5h	4A	4A	0	2	2029
05060001 20 03	Headwaters Little Darby Creek	29.84	5h	4A	4A	0	2	2029
05060001 20 04	Spring Fork	37.96	5h	4A	4A	0	2	2029
05060001 23 01	Scioto Big Run	24.64	3	5h	5	0	2	2025
05060001 23 02	Kian Run-Scioto River	29.5	3	5h	5	0	2	2025
05060002 02 07	Dear Creek Dam-Deer Creek	14.5	3i	5	4C	0	2	2026
05060002 04 03	Lick Run-Scioto River	30.3	3	5	1	0	2	2026
05060002 06 05	Blue Creek-Salt Creek	31.99	1	5h	1	0	2	2021
05060002 08 01	Headwaters Little Salt Creek	33.69	3i	5h	4A	0	2	2021

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05060002 08 04	Pigeon Creek	30.16	3	5h	4A	0	2	2021
05060002 08 05	Sour Run-Little Salt Creek	32.59	5	1h	1t	0	2	2021
05060002 09 03	Pretty Run	17.59	5h	1h	1	0	2	2021
05060002 11 04	Pee Pee Creek	36.24	5	1	4n	0	2	2026
05060002 11 05	Meadow Run-Scioto River	44.15	3	5	1	0	2	2026
05060002 14 02	Mill Creek	17.23	3	4Ah	5	0	2	2021
05060003 01 01	Headwaters Paint Creek	40.51	5h	4Ah	3i	0	2	2022
05060003 01 02	East Fork Paint Creek	51.9	5h	4A	4A	0	2	2022
05060003 06 01	Indian Creek-Paint Creek	46.16	5h	4Ah	4A	0	2	2022
05060003 06 02	Farmers Run-Paint Creek	31.06	5h	4A	4A	0	2	2022
05080001 03 01	Cherokee Mans Run	17.71	5h	3	1	0	2	2023
05080001 03 02	Rennick Creek-Great Miami River	28.94	5h	4A	4A	0	2	2023
05080001 03 03	Rum Creek	28.55	5h	4Ah	4A	0	2	2023
05080001 03 04	Blue Jacket Creek	13.1	5h	4A	1	0	2	2023
05080001 03 05	Bokengehalas Creek	27.74	5h	4Ah	4A	0	2	2023
05080001 03 06	Brandywine Creek-Great Miami River	33.3	5h	4Ah	4A	0	2	2023
05080001 04 01	McKees Creek	17.86	5h	4Ah	1	0	2	2023
05080001 04 02	Lee Creek	22.68	5h	4Ah	1	0	2	2023
05080001 04 04	Indian Creek	15.96	5h	4Ah	3i	0	2	2023
05080001 04 05	Plum Creek	28.62	5h	4Ah	1	0	2	2023
05080001 14 02	Ludlow Creek	41.23	3i	5	4n	0	2	2028
05080001 14 05	Mill Creek-Stillwater River	23.65	3	5	4n	0	2	2028
05080001 15 01	Machochee Creek	18.95	5h	3	1	0	2	2018
05080001 15 02	Headwaters Mad River	36.74	5h	3	1ht	0	2	2018
05080001 15 03	Kings Creek	44.06	5h	3	4Ah	0	2	2018
05080001 16 01	Muddy Creek	22.8	5h	3	4Ah	0	2	2018
05080001 16 02	Dugan Run	23.48	5h	3	4Ah	0	2	2018
05080001 16 04	Anderson Creek	18.44	5h	3	1ht	0	2	2018
05080001 16 05	Storms Creek	9.17	5h	3	1ht	0	2	2018
05080001 18 01	Moore Run	18.42	5h	3	4Ah	0	2	2018

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05080001 18 03	Mill Creek	16.03	5h	3	1ht	0	2	2018
05080001 18 04	Donnels Creek	26.13	5h	3	4nh	0	2	2018
05080001 18 06	Jackson Creek-Mad River	30.64	5h	3	1ht	0	2	2018
05080001 19 01	Mud Creek	22.6	5h	3	4Ah	0	2	2018
05080001 19 02	Mud Run	26.17	5h	3	4Ah	0	2	2018
05080002 02 04	Price Creek	29.23	5h	4A	4A	0	2	2019
05080002 03 02	Aukerman Creek	20.85	5h	3	1	0	2	2019
05080002 03 03	Toms Run	25.73	5h	1h	4A	0	2	2019
05080002 05 02	Paint Creek	22.79	1h	5	1h	0	2	2020
05080002 05 03	Beasley Run-Sevenmile Creek	27.92	1h	5	1h	0	2	2020
05080002 07 01	Elk Creek	47.62	5h	1h	4n	0	2	2025
05080002 07 05	Gregory Creek	29.69	5h	1h	1	0	2	2025
05080002 09 03	Paddys Run	16.3	5h	3	4nh	0	2	2025
05080003 08 10	Jameson Creek-Whitewater River	29.08	3	5	1hx	0	2	2017
05090103 06 04	Frederick Creek	15.7	3	5h	1	0	2	2025
05090103 06 05	Wards Run-Little Scioto River	40.42	5	1h	1	0	2	2025
05090103 06 06	Munn Run-Ohio River	34.85	3	5h	5	0	2	2025
05090201 03 02	Elk Run	15.14	3	5h	4n	0	2	2022
05090201 05 06	Soldiers Run-Ohio Brush Creek	29.84	5	1h	1	0	2	2022
05090201 06 04	Big Threemile Creek	23.63	5h	3	3x	0	2	2016
05090201 07 01	Headwaters West Fork Eagle Creek	39.51	3	3	5hx	0	2	2016
05090201 07 02	Headwaters East Fork Eagle Creek	23.68	3	3	5hx	0	2	2016
05090201 07 03	Hills Fork-East Fork Eagle Creek	24.35	3	3	5hx	0	2	2016
05090201 07 04	Rattlesnake Creek-West Fork Eagle Creek	19.19	3	3	5hx	0	2	2016
05090201 07 05	Eagle Creek	44.81	3	3	5hx	0	2	2016
05090201 09 04	Flat Run-North Fork Whiteoak Creek	30.39	3	5h	4A	0	2	2021
05090202 08 03	Turtle Creek	44.91	3	5h	4n	0	2	2022
05090202 09 01	Muddy Creek	15.86	3	4A	5	0	2	2022
05090202 09 03	Salt Run-Little Miami River	35.3	3	5	3	0	2	2022
05090203 02 03	Muddy Creek	16.59	3	5	5	0	2	2029

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05120101 02 01	Chickasaw Creek	18.63	5h	4Ahx	4Ah	0	2	2022
05120101 02 02	Headwaters Beaver Creek	20.28	5h	4Ahx	4Ah	0	2	2022
05120101 02 03	Coldwater Creek	19.36	5h	4A	4Ah	0	2	2022
04100007 90 01	Auglaize River Mainstem (Ottawa River to mouth)	2435	5	1	1	0	2	2027
04110002 90 01	Cuyahoga River Mainstem (Brandywine Cr. to mouth); including old channel	809	5	4A	4A	0	2	2018
04110004 90 01	Grand River Mainstem (Mill Creek to mouth)	705	5h	4Ah	1	0	2	2019
05040001 90 02	Tuscarawas River Mainstem (Sandy Creek to Stillwater Creek)	1870	5h	3	1	0	2	2017
05040003 90 01	Walhonding River Mainstem (entire length)	2256	5	1h	4C	0	2	2023
05060002 90 02	Scioto River Mainstem (Paint Creek to Sunfish Creek)	5936	5	1	1	0	2	2026
05060002 90 03	Scioto River Mainstem (Sunfish Creek to Ohio River)	6517	5	3	1	0	2	2026
05080003 90 01	Whitewater River Mainstem (entire length)	1474	5	3	1	0	2	2017
05090202 90 01	Little Miami River Mainstem (Caesar Creek to O'Bannon Creek)	1086	5	4Ah	1	0	2	2022
04100001 03 09	Detwiler Ditch-Frontal Lake Erie	7.43	3	1	5	0	1	2026
04100007 03 05	Lost Creek	17.41	1	1d	4A	3i	1	2025
04100007 11 03	Lower Powell Creek	12.87	3i	5h	4A	0	1	2021
04100009 03 01	Upper Bad Creek	22.81	3	1	5hx	0	1	2015
04100009 06 02	Sugar Creek-Maumee River	21.72	3	5	3x	0	1	2015
04100009 07 02	Fewless Creek-Swan Creek	28.34	3	4Ah	4A	3i	1	2017
04100010 01 01	Rader Creek	32.71	3	4A	4A	3i	1	2021
04100010 01 03	Rocky Ford	73.53	3	4A	4A	3i	1	2021
04110001 05 01	Charlemont Creek	26.08	1h	4A	5d	1	1	2027
04110001 06 03	Heider Ditch-Frontal Lake Erie	26.3	3	4A	5d	0	1	2027
04110001 07 03	Quarry Creek-Frontal Lake Erie	25.59	3	5	3x	0	1	2015
04110003 05 01	Marsh Creek-Frontal Lake Erie	28.33	3	5	3	0	1	2015
05030101 05 04	Patterson Creek-West Fork Little Beaver Creek	52.42	3	5	4Ah	0	1	2020
05030103 04 06	Chocolate Run-Mahoning River	16.57	3i	4Ah	5	0	1	2022
05030103 07 04	Squaw Creek	18.63	3	3	5	0	1	2028

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05030106 02 01	South Fork Short Creek	14.48	3	1h	5	0	1	2025
05030106 02 04	Piney Fork	22.58	3	5	1	0	1	2025
05030106 02 06	Little Short Creek	17.63	3	1h	5	0	1	2025
05030106 12 07	Pipe Creek-Ohio River	35.14	3	1h	5	0	1	2025
05030106 12 08	Big Run-Ohio River	11.12	3	3	5h	0	1	2025
05030201 10 09	Cow Creek-Ohio River	48.14	3	5h	3i	0	1	2024
05030202 02 01	Headwaters West Branch Shade River	22.19	3	5	3x	0	1	2015
05030202 08 02	Groundhog Creek-Ohio River	37.57	1h	5	3x	0	1	2015
05030202 08 04	West Creek-Ohio River	52.74	1	5	3x	0	1	2015
05030202 09 04	Crooked Creek-Ohio River	44.54	3	3	5hx	0	1	2015
05030204 01 01	Center Branch	24.83	1	4A	4Ah	3	1	2019
05040001 07 04	Headwaters Middle Conotton Creek	15.21	3	5	3x	0	1	2016
05040001 08 04	Huff Run	13.94	3	1	5	0	1	2016
05040001 15 04	Middle Little Stillwater Creek	25.24	3	1	5	0	1	2027
05040001 16 03	Weaver Run-Stillwater Creek	16.12	1	1	5	0	1	2027
05040002 05 02	Middle Muddy Fork Mohican River	27.54	3	5h	1	0	1	2023
05040002 06 06	Glenn Run-Jerome Fork Mohican River	17.86	3	5h	1	0	1	2023
05040002 07 01	Grab Run	34.18	3	5h	1	0	1	2023
05040003 03 05	Little Schenck Creek	16.26	3	5h	1	0	1	2022
05040003 06 02	Apple Creek	38.89	3	5	1	0	1	2024
05040003 07 01	Paint Creek	30.38	3	5h	1	0	1	2024
05040003 07 02	Martins Creek	22.97	3	5h	3i	0	1	2024
05040003 09 08	Crooked Creek-Walhonding River	18.33	3	5h	4n	0	1	2025
05040004 03 01	Robinson Run-Muskingum River	34.16	3	1h	5	0	1	2025
05040004 03 02	Village of Adams Mills-Muskingum River	19.24	3	5h	3	0	1	2025
05040004 06 05	Manns Fork Salt Creek	19.81	3i	4Ah	1	1	1	2023
05040004 08 06	Oilspring Run-Muskingum River	22.01	3	1	5	0	1	2028
05040004 10 03	Coal Run	21.86	3	5	1	0	1	2028
05040004 11 05	Congress Run-Muskingum River	21.18	3	1	5	0	1	2028
05040005 01 01	Headwaters Seneca Fork	29.19	3	5	1	0	1	2029

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05040005 04 06	Beeham Run-Salt Fork	21.83	1	1	5	0	1	2029
05040005 05 08	Wolf Run-Wills Creek	26.79	1	3	5	0	1	2029
05060001 06 03	Blues Creek	37.06	3	1	5d	0	1	2027
05060001 08 01	Headwaters Olentangy River	49.56	1h	4A	4Ah	3i	1	2018
05060001 10 07	Delaware Run-Olentangy River	43.89	1h	4Ahx	4A	3i	1	2018
05060001 13 08	Hoover Reservoir-Big Walnut Creek	30.17	1	1d	3t	1	1	2020
05060001 14 04	Alum Creek Dam-Alum Creek	20.27	1	1d	3t	1	1	2020
05060001 15 01	Rocky Fork Creek	30.39	3	4Ahx	5	0	1	2020
05060002 02 01	South Fork Bradford Creek-Bradford Creek	30.04	3	5	1	0	1	2026
05060002 03 03	Waugh Creek	20.43	3	5	1	0	1	2026
05060002 14 06	Beech Fork-South Fork Scioto Brush Creek	16.77	3	1h	5	0	1	2021
05060003 03 01	Wilson Creek	21.48	3	4Ah	5	0	1	2022
05080001 05 01	Headwaters Loramie Creek	43.11	3	4A	5	0	1	2023
05080001 09 03	North Fork Stillwater River	18.92	1h	5	4A	0	1	2028
05080001 09 04	Boyd Creek	14.09	1h	5	1d	0	1	2028
05080001 12 04	Harris Creek	17.91	1h	5	4A	0	1	2028
05080001 13 01	Little Painter Creek	12.28	3	5	1d	0	1	2028
05080001 13 02	Painter Creek	35.06	3	5	4n	0	1	2028
05080001 14 01	Brush Creek	23.07	3	5	4A	0	1	2028
05090101 02 02	West Branch Raccoon Creek	22.72	3	3	5	0	1	2016
05090101 03 03	Flat Run-Elk Fork	16.2	3	3	5	0	1	2016
05090101 04 02	Dickason Run	27.22	3	3	5hx	0	1	2016
05090101 04 04	Deer Creek-Little Raccoon Creek	28.29	3	3	5hx	0	1	2016
05090101 05 01	Pierce Run	12.7	3	3	5	0	1	2016
05090103 05 02	Sugarcamp Creek	14.42	3	5h	1	0	1	2025
05090201 04 01	Little West Fork Ohio Brush Creek	22.57	3	1h	5	0	1	2022
05090201 04 02	Headwaters West Fork Ohio Brush Creek	38.87	3	1h	5	0	1	2022
05090201 04 03	Cherry Fork	33.82	3	1h	5	0	1	2022
05090201 04 04	Georges Creek-West Fork Ohio Brush Creek	38.74	3	1h	5	0	1	2022
05090201 08 01	Redoak Creek	19.73	3	3	5hx	0	1	2016

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05090201 08 03	Evans Run-Straight Creek	23.53	3	3	5hx	0	1	2016
05090201 08 04	Lee Creek-Ohio River	35.44	3	3	5hx	0	1	2016
05090201 12 06	Tenmile Creek	13.04	3	5	1	0	1	2029
05090202 04 05	Flat Fork	16.8	1h	1	5	0	1	2026
05090202 04 06	Lower Caesar Creek	41.18	1	1	4n	3i	1	2026
05090202 06 04	Headwaters Cowan Creek	31.51	1	3	4A	3i	1	2022
05090202 07 03	First Creek	19.5	3	3	5	0	1	2022
05090202 14 04	Duck Creek	15.45	3	3	5d	0	1	2022
05090202 14 06	Clough Creek-Little Miami River	18.7	3	3	5d	0	1	2022
05120101 01 01	Headwaters Wabash River	31.49	3i	3	5hx	0	1	2022
05120101 01 02	Stoney Creek-Wabash River	59.17	3	3	5hx	0	1	2022
05120101 01 03	Toti Creek-Wabash River	33.76	3	3	5hx	0	1	2022
05120101 05 01	Hickory Branch-Wabash River	23.46	3	3	5hx	0	1	2022
04100002 03 01	Headwaters Bear Creek	17.8	3	1	1	0	0	2026
04100002 03 03	Nile Ditch	24.6	3	3	3	0	0	2026
04100003 01 04	Bird Creek-East Branch St Joseph River	29.61	3	3	3	0	0	2028
04100003 04 05	Town of Alvarado-Fish Creek	16.07	3	3	3	0	0	2028
04100004 04 04	Little Blue Creek	16.61	3	3	3x	0	0	2015
04100006 02 01	Silver Creek-Bean Creek	21.65	3	3	3	0	0	2028
04100006 02 03	Old Bean Creek	33.33	3	1	1	0	0	2028
04100007 01 05	Dry Run-Auglaize River	24.23	3i	4A	4Ah	0	0	2018
04100007 02 02	Village of Buckland-Auglaize River	9.98	1	4Ahx	1ht	0	0	2018
04100007 02 03	Sims Run-Auglaize River	28.8	1	4Ahx	4Ah	3i	0	2018
04100007 07 03	Prairie Creek	39.22	1	1	1	0	0	2029
04100007 08 05	Middle Creek	16.4	3i	1	1	0	0	2029
04100007 08 06	Burt Lake-Little Auglaize River	13.93	1	1	1	0	0	2029
04100007 09 04	Big Run-Auglaize River	21.03	1	4A	1ht	0	0	2018
04100007 09 05	Lapp Ditch-Auglaize River	21.23	3	4Ahx	1ht	0	0	2018
04100007 09 07	Town of Oakwood-Auglaize River	16.5	3	4Ahx	3t	0	0	2018
04100007 11 01	North Powell Creek	46.81	3	3	4A	0	0	2021

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04100007 11 02	Upper Powell Creek	38.83	3i	3	4A	0	0	2021
04100007 12 04	Brown Ditch-Flatrock Creek	24.39	3	3	3	0	0	2029
04100008 02 05	City of Findlay Riverside Park-Blanchard River	16.22	1	4Ah	4A	3i	0	2020
04100008 04 01	Binkley Ditch-Little Riley Creek	14.36	3	4Ah	4A	0	0	2020
04100008 04 02	Upper Riley Creek	14.35	3	4Ah	4A	0	0	2020
04100008 04 03	Marsh Run-Little Riley Creek	16.25	3	4Ah	4A	0	0	2020
04100008 04 04	Middle Riley Creek	15.62	3	4A	4A	0	0	2020
04100008 04 05	Lower Riley Creek	25.14	3	4A	4A	0	0	2020
04100008 05 06	Village of Gilboa-Blanchard River	41.2	3i	4Ah	1	0	0	2020
04100008 06 01	Cranberry Creek	45.26	3	4Ah	1	0	0	2020
04100008 06 02	Pike Run-Blanchard River	28.64	3	4A	4A	3i	0	2020
04100008 06 03	Miller City Cutoff	22.64	3	4Ah	4A	0	0	2020
04100008 06 04	Bear Creek	12.67	3	4Ah	1	0	0	2020
04100008 06 05	Deer Creek-Blanchard River	39.36	3	4Ah	4A	0	0	2020
04100009 07 01	Ai Creek	50.83	3	4A	4A	0	0	2017
04100009 07 03	Gale Run-Swan Creek	16.91	3	4Ah	4A	0	0	2017
04100009 08 01	Upper Blue Creek	20.28	3	4Ah	3i	0	0	2017
04100009 08 02	Lower Blue Creek	24.49	3	4Ah	4A	0	0	2017
04100009 08 03	Wolf Creek	27.16	3	4Ah	4A	0	0	2017
04100009 09 01	Grassy Creek Diversion	24.78	3	4Ah	3i	0	0	2017
04100009 09 02	Grassy Creek	13.68	3i	4Ah	4A	0	0	2017
04100009 09 03	Crooked Creek-Maumee River	18.89	3	3	3	0	0	2017
04100009 09 04	Delaware Creek-Maumee River	19.25	3i	4Ah	4A	0	0	2017
04100010 01 02	Needles Creek	31.42	3	4Ah	4A	0	0	2021
04100010 01 04	Town of Rudolph-Middle Branch Portage River	31.14	3	4Ah	1	0	0	2021
04100010 02 01	Bull Creek	30.47	3	4Ah	4A	0	0	2021
04100010 02 05	Cessna Ditch-Middle Branch Portage River	25.44	3	4Ah	1	0	0	2021
04100010 05 03	Lacarpe Creek-Frontal Lake Erie	40.3	3	3	3	0	0	2021
04100010 07 01	Turtle Creek-Frontal Lake Erie	40.66	3	4Ah	4A	0	0	2017
04100010 07 02	Crane Creek-Frontal Lake Erie	56.48	3	4Ah	4A	0	0	2017

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04100010 07 03	Cedar Creek-Frontal Lake Erie	58.05	3	4Ah	4A	0	0	2017
04100010 07 04	Wolf Creek-Frontal Lake Erie	15.16	3	4Ah	3i	0	0	2017
04100010 07 05	Berger Ditch	16.06	3	4Ah	4A	0	0	2017
04100010 07 06	Otter Creek-Frontal Lake Erie	18.13	3i	4Ah	4A	0	0	2017
04100011 01 01	Sawmill Creek	14.28	3	4A	1	0	0	2024
04100011 01 02	Pipe Creek-Frontal Sandusky Bay	48.54	3	4A	4A	0	0	2024
04100011 02 01	Frontal South Side of Sandusky Bay	43.42	3	4A	4A	0	0	2024
04100011 02 02	Strong Creek	15.87	3	4A	3	0	0	2024
04100011 02 03	Pickerel Creek	48.48	3i	4A	4A	0	0	2024
04100011 02 05	South Creek	22	3	4A	4A	0	0	2024
04100011 03 01	Brandywine Creek-Broken Sword Creek	55.3	3	4Ahx	4A	0	0	2021
04100011 03 02	Indian Run-Broken Sword Creek	39.04	3	4Ahx	4Ah	0	0	2021
04100011 05 01	Prairie Run	14.27	3	4Ahx	1ht	0	0	2019
04100011 05 02	Headwaters Tymochtee Creek	20.69	3	4Ahx	4Ah	0	0	2019
04100011 05 03	Carroll Ditch	14.56	3	4Ahx	3iht	0	0	2019
04100011 05 04	Paw Paw Run	16.8	3	4Ahx	4Ah	0	0	2019
04100011 05 05	Reevhorn Run	15.35	3	4Ahx	3iht	0	0	2019
04100011 05 06	Upper Little Tymochtee Creek	19.12	3	4Ahx	4Ah	0	0	2019
04100011 05 07	Lower Little Tymochtee Creek	17.81	3	4Ahx	4Ah	0	0	2019
04100011 05 08	Warpole Creek	20.68	3	4Ahx	3iht	0	0	2019
04100011 05 09	Enoch Creek-Tymochtee Creek	35.17	3	4Ahx	4Ah	0	0	2019
04100011 06 01	Oak Run	15.3	3	3	3t	0	0	2019
04100011 06 02	Baughman Run-Tymochtee Creek	27.34	3	3	4Ah	0	0	2019
04100011 06 03	Hart Ditch-Little Tymochtee Creek	31.52	3	3	4Ah	0	0	2019
04100011 07 01	Little Sandusky River	36.04	1h	4Ahx	4Ah	0	0	2019
04100011 08 01	Brokenknife Creek	18.9	3	3	4Ah	0	0	2019
04100011 08 02	Upper Honey Creek	40.96	3	3	4Ah	0	0	2019
04100011 08 03	Aicholz Ditch	18.04	3	3	4Ah	0	0	2019
04100011 08 04	Silver Creek	24.62	3	3	4Ah	0	0	2019
04100011 09 01	Taylor Run	19.29	3	3	4Ah	0	0	2019

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04100011 09 02	Headwaters Sycamore Creek	40.55	3	3	1ht	0	0	2019
04100011 09 04	Thorn Run-Sandusky River	21.36	3	3	4Ah	0	0	2019
04100011 09 05	Mile Run-Sandusky River	16.69	3	3	4Ah	0	0	2019
04100011 10 01	East Branch East Branch Wolf Creek	21.9	3	4Ah	4A	0	0	2024
04100011 10 02	Town of New Riegel-East Branch Wolf Creek	33.4	3	4Ah	4A	0	0	2024
04100011 10 03	Snuff Creek-East Branch Wolf Creek	29.22	3	4Ah	1	0	0	2024
04100011 10 04	Wolf Creek	73.45	3	4A	4A	0	0	2024
04100011 11 01	Rock Creek	34.78	3	3	4Ah	0	0	2024
04100011 11 02	Morrison Creek	20.34	3	3	4Ah	0	0	2024
04100011 11 03	Willow Creek-Sandusky River	16.62	3	3	4Ah	0	0	2024
04100011 11 04	Sugar Creek	13.52	3	3	1	0	0	2024
04100011 11 05	Spicer Creek-Sandusky River	30.86	3	3	4A	0	0	2024
04100011 12 01	Westerhouse Ditch	20.68	3	4Ah	1	0	0	2024
04100011 13 01	Muskellunge Creek	46.31	3i	4Ah	4A	0	0	2024
04100011 13 02	Indian Creek-Sandusky River	37.59	3	4Ah	3i	0	0	2024
04100011 13 03	Mouth Sandusky River	24.85	3	3	4A	0	0	2024
04100011 14 01	Gries Ditch	13.93	3	4Ah	1	0	0	2024
04100011 14 02	Town of Helena-Muddy Creek	45.21	3	4Ah	1	0	0	2024
04100011 14 05	North Side Sandusky Bay Frontal	26.53	3	3	3	0	0	2024
04100012 03 01	Sugar Creek-Frontal Lake Erie	19.5	3	3	4Ah	0	0	2021
04100012 03 02	Chappel Creek	23.99	3	3	4Ah	0	0	2021
04100012 03 03	Cranberry Creek-Frontal Lake Erie	12.64	3	3	3t	0	0	2021
04100012 04 01	Marsh Run	31.49	3	4Ahx	4Ah	0	0	2016
04100012 04 02	Town of Plymouth-West Branch Huron River	31	3	4A	4Ah	0	0	2016
04100012 04 03	Walnut Creek-West Branch Huron River	23.69	3	4Ahx	1ht	3	0	2016
04100012 04 04	Holliday Lake	13.73	3	1t	4Ah	0	0	2016
04100012 04 05	Peru Township-West Branch Huron River	32.3	3	4Ahx	4Ah	0	0	2016
04100012 05 01	Mud Run	15.54	3	3	4Ah	0	0	2016
04100012 05 02	Slate Run	31.01	3	3	4Ah	0	0	2016
04100012 05 04	Seymour Creek	16.2	3	3	1ht	0	0	2016

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04100012 05 05	Unnamed Creek "C"	15.97	3	3	1ht	0	0	2016
04100012 06 01	Headwaters East Branch Huron River	28.94	3	4Ahx	4Ah	0	0	2016
04100012 06 02	Cole Creek	23.05	3	4Ahx	1ht	0	0	2016
04100012 06 04	Mouth East Branch Huron River	15.29	3	4Ahx	1ht	3	0	2016
04100012 06 05	Unnamed Creek "B"	18.16	3	4A	4Ah	0	0	2016
04110001 03 03	Coon Creek-East Branch Black River	38.31	1h	4A	4C	0	0	2027
04110001 04 01	Town of Litchfield-East Branch Black River	36.06	1	4A	1d	0	0	2027
04110001 04 02	Salt Creek-East Branch Black River	33.93	1	4A	4n	0	0	2027
04110001 05 03	Wellington Creek	29.61	1	4A	4A	0	0	2027
04110002 01 01	East Branch Reservoir-East Branch Cuyahoga River	18.58	1	1h	4Ah	5	0	2018
04110002 01 06	Sawyer Brook-Cuyahoga River	20.44	1h	3	4Ah	0	0	2018
04110002 03 02	Mogadore Reservoir-Little Cuyahoga River	12.91	1	3	4Ah	0	0	2018
04110002 04 01	Mud Brook	29.77	1h	4Ahx	4Ah	0	0	2018
04110002 05 05	Willow Lake-Cuyahoga River	24.23	3	3	4A	0	0	2018
04110002 06 01	Mill Creek	19.26	3	4Ahx	4A	0	0	2018
04110002 06 02	Village of Independence-Cuyahoga River	16.97	3	4Ahx	4Ah	0	0	2018
04110002 06 03	Big Creek	37.37	3	4Ahx	4A	0	0	2018
04110002 06 04	Cuyahoga Heights-Cuyahoga River	19.08	3	4Ahx	4A	0	0	2018
04110002 06 05	City of Cleveland-Cuyahoga River	23.58	3	4Ahx	3t	0	0	2018
04110003 04 01	East Branch Chagrin River	51.33	3	4Ahx	4A	0	0	2021
04110003 04 03	Town of Willoughby-Chagrin River	17.97	3	4Ahx	4A	0	0	2021
04110003 05 02	City of Euclid-Frontal Lake Erie	20.57	3	3	3	0	0	2015
04110004 01 04	Center Creek-Grand River	31.43	3	4Ah	4A	0	0	2019
04110004 01 05	Coffee Creek-Grand River	19.03	3	4Ah	1	0	0	2019
04110004 02 02	Middle Rock Creek	21.37	1h	4Ah	4A	0	0	2019
04110004 04 01	Griggs Creek	20.68	1h	4Ah	4nh	0	0	2019
04110004 04 02	Peters Creek-Mill Creek	54.81	1	4Ah	4Ah	0	0	2019
04110004 05 02	Bronson Creek-Grand River	36.11	1h	4Ah	4n	0	0	2019
04110004 06 01	Coffee Creek-Grand River	22.01	3	4A	3ih	0	0	2019
04110004 06 02	Mill Creek	20.99	3	4Ah	1h	0	0	2019

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04110004 06 03	Village of Mechanicsville-Grand River	16.62	3	3	3	0	0	2019
04110004 06 04	Paine Creek	28.83	3	4Ah	4nh	0	0	2019
04110004 06 05	Talcott Creek-Grand River	19.32	3	1h	3ih	0	0	2019
04110004 06 06	Big Creek	50.42	3	4A	4Ah	0	0	2019
04110004 06 07	Red Creek-Grand River	26.3	3	4Ah	4Ah	0	0	2019
04120101 04 09	Turkey Creek-Frontal Lake Erie	24.65	3	3	3	0	0	2015
04120101 06 03	West Branch Conneaut Creek	15.72	3	3	3	0	0	2015
05030101 05 01	Cold Run	14.48	3	3	1ht	3	0	2020
05030101 05 03	Brush Creek	27.2	3	3	4Ah	0	0	2020
05030101 11 02	Little Yellow Creek	22.75	1h	3	4A	0	0	2025
05030101 11 03	Carpenter Run-Ohio River	36.37	1h	3	4A	0	0	2025
05030101 11 06	Hardin Run-Ohio River	41.94	1	1h	1	0	0	2025
05030101 11 07	Island Creek	26.35	3	1h	1	0	0	2025
05030101 11 09	Wills Creek-Ohio River	37.02	3	1h	1	0	0	2025
05030102 01 05	Pymatuning Reservoir	25.49	1	3	3	0	0	2023
05030102 04 01	Sugar Run-Shenango River	31.28	3	3	3	0	0	2023
05030102 06 03	McCullough Run-Shenango River	36.78	3	3	3	0	0	2023
05030102 06 06	Deer Creek-Shenango River	53.77	3	3	3	0	0	2023
05030103 01 01	Beaver Run-Mahoning River	41.14	3	4Ah	4A	0	0	2022
05030103 03 05	Town of Newton Falls-West Branch Mahoning River	27.53	1	4Ah	4A	0	0	2022
05030103 04 05	Mouth Eagle Creek	20.7	1	4Ah	1	0	0	2022
05030103 08 08	Hickory Run	27.11	3	3	3	0	0	2028
05030106 07 01	Williams Creek	12.38	3	1h	1	0	0	2024
05030106 09 06	Cat Run-Captina Creek	17.45	3i	1	4n	0	0	2024
05030106 12 05	Boggs Run-Ohio River	16.89	3	3	3	0	0	2025
05030106 12 06	Wegee Creek-Ohio River	38.1	3	1h	4n	0	0	2025
05030201 01 02	Piney Fork	15.61	3	1h	1	0	0	2024
05030201 01 04	Lower Sunfish Creek	43.12	3i	1h	1	0	0	2024
05030201 07 01	Clear Fork Little Muskingum River	48.82	3	1	1h	0	0	2015
05030201 08 01	Upper East Fork Duck Creek	31.64	3	3	4Ah	0	0	2020

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05030201 08 02	Middle Fork Duck Creek	26.5	3	3	4Ah	0	0	2020
05030201 08 03	Middle East Fork Duck Creek	40.33	3	3	4Ah	0	0	2020
05030201 08 04	Paw Paw Creek	23.42	3	3	4Ah	0	0	2020
05030201 08 05	Lower East Fork Duck Creek	14.33	3	3	4Ah	0	0	2020
05030201 10 01	Stillhouse Run-Ohio River	19.45	3	3	3t	0	0	2024
05030201 10 02	Opossum Creek	25.31	3	1h	1	0	0	2024
05030201 10 04	Haynes Run-Ohio River	30.29	3	3	3	0	0	2024
05030201 10 05	Patton Run-Ohio River	32.14	3	3	3i	0	0	2024
05030201 10 07	Leith Run-Ohio River	26.8	3	1h	3i	0	0	2024
05030201 10 10	Bull Creek-Ohio River	43.08	3	3	3	0	0	2024
05030202 04 04	Forked Run-Ohio River	35.85	1	3	3x	0	0	2015
05030202 07 02	Mud Fork	13.25	3	3	4A	0	0	2018
05030202 07 03	Ogden Run-Leading Creek	23.89	3	1h	1t	0	0	2018
05030202 07 05	Thomas Fork	31.13	3	1h	4A	0	0	2018
05030202 08 05	Broad Run-Ohio River	50.96	1h	3	3x	0	0	2015
05030204 01 03	Clark Run-Rush Creek	28.49	3	4Ah	4Ah	0	0	2019
05030204 02 01	Headwaters Little Rush Creek	28.42	3	4Ah	1ht	0	0	2019
05030204 02 02	Indian Creek-Little Rush Creek	32.93	3	4Ah	4Ah	0	0	2019
05030204 02 03	Raccoon Run	27.35	3	4Ah	4Ah	0	0	2019
05030204 02 04	Turkey Run-Rush Creek	47.34	1	4A	4Ah	0	0	2019
05030204 04 01	Headwaters Hocking River	47.66	1h	4A	4Ah	0	0	2019
05030204 06 01	Clear Fork	16.03	1h	4Ah	4Ah	0	0	2019
05030204 06 05	Harper Run-Hocking River	26.94	3	4A	4Ah	0	0	2019
05030204 06 06	Dorr Run-Hocking River	32.79	3	4A	4Ah	0	0	2019
05030204 07 01	East Branch Sunday Creek	33.13	1	4A	4Ah	1	0	2019
05030204 07 02	Dotson Creek-Sunday Creek	24.18	3	4A	4A	0	0	2019
05030204 07 03	West Branch Sunday Creek	42.49	3	4A	4A	0	0	2019
05030204 07 04	Greens Run-Sunday Creek	39.06	3	4A	4A	0	0	2019
05030204 08 01	Hamley Run-Hocking River	22.21	3	4Ah	4Ah	0	0	2019
05030204 08 02	Headwaters Margaret Creek	33.07	3	4A	4Ah	0	0	2019

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05030204 08 03	Factory Creek-Margaret Creek	26.93	3	4Ah	4Ah	0	0	2019
05030204 08 04	Coates Run-Hocking River	19.61	3	4Ah	1ht	0	0	2019
05030204 09 01	Miners and Hyde Forks	16.55	3	4Ah	1ht	0	0	2019
05030204 09 02	McDougall Branch	37.56	3	4Ah	1ht	0	0	2019
05030204 09 03	Kasler Creek-Federal Creek	15.51	3	4Ah	4nh	0	0	2019
05030204 09 04	Sharps Fork	35.71	3	4Ah	4Ah	0	0	2019
05030204 09 05	Big Run-Federal Creek	39.36	3	4Ah	4A	0	0	2019
05030204 10 02	Piper Run-Hocking River	20.57	3	3	3t	0	0	2019
05030204 10 03	Fourmile Creek	16.19	1h	3	1ht	0	0	2019
05030204 10 04	Frost Run-Hocking River	41.84	3	3	4Ah	0	0	2019
05040001 03 02	Nimisila Reservoir-Nimisila Creek	17.41	1	4Ah	4Ah	0	0	2017
05040001 03 05	Town of Canal Fulton-Tuscarawas River	14.49	3	4A	3t	0	0	2017
05040001 03 09	West Sippo Creek-Tuscarawas River	29.63	3	4Ah	4Ah	0	0	2017
05040001 07 01	Headwaters Upper Conotton Creek	13.95	3	3	3x	0	0	2016
05040001 07 02	Irish Creek	18.85	3	3	3x	0	0	2016
05040001 07 03	Dining Fork	14.79	3	3	3x	0	0	2016
05040001 07 05	North Fork McGuire Creek	26.67	3	3	3x	0	0	2016
05040001 07 06	McGuire Creek	22.97	3	3	3x	0	0	2016
05040001 07 07	Headwaters Lower Conotton Creek	29.5	3	3	3x	0	0	2016
05040001 08 01	Cold Spring Run-Indian Fork	32.86	3	1	3x	0	0	2016
05040001 08 02	Pleasant Valley Run-Indian Fork	37.49	3	3	3x	1	0	2016
05040001 08 03	Thompson Run-Conotton Creek	24.96	3	3	3x	0	0	2016
05040001 08 05	Dog Run-Conotton Creek	35.23	3	1	3x	0	0	2016
05040001 09 01	Little Sugar Creek	18.19	3	4A	4Ah	0	0	2017
05040001 09 02	Town of Smithville-Sugar Creek	28.17	3	4A	4Ah	0	0	2017
05040001 09 03	North Fork Sugar Creek	18.01	3	4A	4Ah	0	0	2017
05040001 09 04	Town of Brewster-Sugar Creek	33.11	3	4Ahx	4Ah	0	0	2017
05040001 10 01	Upper South Fork Sugar Creek	35.03	3	4A	4Ah	0	0	2017
05040001 10 02	East Branch South Fork Sugar Creek	28.2	3	4Ahx	4Ah	0	0	2017
05040001 10 03	Indian Trail Creek	16.38	3	4Ahx	4Ah	0	0	2017

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05040001 10 04	Walnut Creek	31.67	3	4A	4Ah	0	0	2017
05040001 10 05	Lower South Fork Sugar Creek	26.54	3	4Ahx	4Ah	0	0	2017
05040001 11 01	Headwaters Middle Fork Sugar Creek	27.73	3	4Ahx	1ht	0	0	2017
05040001 11 02	Misers Run-Middle Fork Sugar Creek	19.53	3	4Ahx	4Ah	0	0	2017
05040001 11 03	Beach City Reservoir-Sugar Creek	17.57	3	4A	4Ah	0	0	2017
05040001 11 04	Broad Run	19.65	3	4Ahx	4Ah	0	0	2017
05040001 11 05	Brandywine Creek-Sugar Creek	36.91	3i	4A	4A	0	0	2017
05040001 12 01	Pigeon Run	9.57	3	4Ah	1ht	0	0	2017
05040001 12 02	City of Massillon-Tuscarawas River	14.32	3	4Ah	3t	0	0	2017
05040001 12 03	Wolf Creek-Tuscarawas River	52.14	3	4A	4Ah	0	0	2017
05040001 12 04	Wolf Run-Tuscarawas River	37.17	3	4Ah	4Ah	0	0	2017
05040001 13 04	Buttermilk Creek-Stillwater Creek	47.99	1	1	3i	0	0	2027
05040001 17 01	Stone Creek	38.47	3	4Ah	4Ah	0	0	2017
05040001 17 02	Oldtown Creek	19.26	3	4Ah	4Ah	0	0	2017
05040001 17 03	Beaverdam Creek	21.97	3	4Ah	4A	0	0	2017
05040001 17 04	Pone Run-Tuscarawas River	21.39	3	1d	3t	0	0	2017
05040001 18 01	Dunlap Creek	25.41	3	4Ah	4Ah	0	0	2017
05040001 18 02	Mud Run-Tuscarawas River	52.38	3	4Ah	4Ah	0	0	2017
05040001 18 03	Buckhorn Creek	23.32	3	4Ah	4Ah	0	0	2017
05040001 18 04	Blue Ridge Run-Tuscarawas River	22.66	3	4Ah	3t	0	0	2017
05040001 19 01	Evans Creek	24.25	3i	4Ah	1ht	0	0	2017
05040001 19 02	West Fork White Eyes Creek	20.95	3	4Ah	1ht	0	0	2017
05040001 19 03	White Eyes Creek	33.09	3	4Ah	4Ah	0	0	2017
05040001 19 04	Morgan Run-Tuscarawas River	38.32	3	4Ah	4Ah	0	0	2017
05040002 02 02	Seymour Run-Black Fork	21.65	1h	3	3	0	0	2023
05040002 04 04	Pine Run	14.15	3	1h	1	0	0	2023
05040002 08 04	Sigafoos Run-Mohican River	28.45	3	3	3	0	0	2023
05040002 08 06	Flat Run-Mohican River	27.41	3	3	3	0	0	2023
05040003 01 03	Job Run-North Branch Kokosing River	20.87	3i	1	1	0	0	2022
05040003 03 01	Dry Creek	33.93	3	1h	1	0	0	2022

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05040003 04 03	Brush Run-Kokosing River	32.29	1	1h	1	0	0	2022
05040004 01 04	Jug Run-Wakatomika Creek	36.45	1h	4Ahx	1ht	0	0	2018
05040004 02 04	Town of Frazeysburg-Wakatomika Creek	18.91	1h	4Ahx	4Ah	0	0	2018
05040004 04 01	Valley Run	29.43	3	4Ah	4A	0	0	2023
05040004 04 02	Headwaters Jonathon Creek	28	3	4Ah	1	0	0	2023
05040004 04 03	Turkey Run	14.26	3	4Ah	1	0	0	2023
05040004 04 05	Kent Run	22.82	3	4Ah	1	3i	0	2023
05040004 04 06	Thompson Run	15.46	3	4Ah	1	0	0	2023
05040004 04 07	Painter Creek-Jonathon Creek	60.61	3i	4Ah	4C	1	0	2023
05040004 05 01	Black Fork	28.75	3	4Ah	4A	1	0	2023
05040004 05 02	Upper Moxahala Creek	39.08	3	1h	4A	0	0	2023
05040004 05 03	Middle Moxahala Creek	18.64	3	1	4A	0	0	2023
05040004 05 04	Lower Moxahala Creek	22.11	3	4Ah	4A	0	0	2023
05040004 06 01	Little Salt Creek	14.73	3	4Ah	1	0	0	2023
05040004 06 02	Headwaters Salt Creek	46.1	3	4Ah	1	0	0	2023
05040004 06 03	Buffalo Fork	27.55	3	4Ah	1	0	0	2023
05040004 06 04	Boggs Creek	18.21	3	4Ah	1	0	0	2023
05040004 06 06	Mouth Salt Creek	18.48	3	4Ah	1	0	0	2023
05040004 07 01	Mans Fork	28.13	3	1	1	0	0	2028
05040004 07 02	Headwaters Meigs Creek	35.79	3	1	1	0	0	2028
05040004 07 03	Dyes Fork	45.05	3	1	1	0	0	2028
05040004 08 05	Blue Rock Creek-Muskingum River	23.2	3	1h	4n	0	0	2028
05040004 12 01	Big Run	18.24	3	1	1	0	0	2027
05040005 01 04	Depue Run-Seneca Fork	24.24	3i	1	3	0	0	2029
05040005 06 04	Wills Creek Dam-Wills Creek	27.14	1	1	3	0	0	2029
05040005 06 05	Mouth Wills Creek	11.77	1	3	3	0	0	2029
05040006 05 04	Bowling Green Run-Licking River	24.88	3	3	4n	0	0	2023
05060001 05 02	Davids Run-Scioto River	17.2	3	3	3	0	0	2024
05060001 05 05	Ottawa Creek-Scioto River	46.37	3	3	1	0	0	2024
05060001 09 02	Headwaters Whetstone Creek	62.86	1h	4A	4Ah	0	0	2018

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05060001 09 03	Claypool Run-Whetstone Creek	21.63	1h	4Ahx	4Ah	0	0	2018
05060001 10 03	Beaver Run-Olentangy River	24.04	1h	4Ahx	4Ah	0	0	2018
05060001 10 05	Brandige Run-Olentangy River	29.79	1h	4Ahx	4Ch	0	0	2018
05060001 10 06	Indian Run-Olentangy River	15	1h	4Ahx	1ht	0	0	2018
05060001 11 01	Deep Run-Olentangy River	48.91	1h	4A	4A	3i	0	2018
05060001 11 02	Rush Run-Olentangy River	30.65	1h	4A	1ht	0	0	2018
05060001 11 03	Mouth Olentangy River	32	1h	4Ahx	4A	0	0	2018
05060001 13 01	Culver Creek	13.22	3	4Ahx	4Ah	0	0	2020
05060001 13 02	Headwaters Big Walnut Creek	55.33	3	4Ahx	4Ah	0	0	2020
05060001 13 03	Rattlesnake Creek	22.08	3	4Ahx	4Ah	0	0	2020
05060001 13 04	Perfect Creek-Big Walnut Creek	10.1	3	4Ahx	1ht	0	0	2020
05060001 13 05	Little Walnut Creek	32.83	3	4Ahx	4Ah	0	0	2020
05060001 13 06	Prairie Run-Big Walnut Creek	8.38	3	4A	4Ah	0	0	2020
05060001 13 07	Duncan Run	16.79	3	4Ahx	4Ah	0	0	2020
05060001 14 01	West Branch Alum Creek	29.47	1h	4A	4Ah	0	0	2020
05060001 14 02	Headwaters Alum Creek	35.55	1h	4Ahx	4Ah	0	0	2020
05060001 14 03	Big Run-Alum Creek	37.17	1h	1d	4Ah	1	0	2020
05060001 15 02	City of Gahanna-Big Walnut Creek	15.91	3	4Ahx	4Ah	1	0	2020
05060001 15 03	Headwaters Blacklick Creek	48.88	3	4Ahx	4Ah	0	0	2020
05060001 15 05	Mason Run-Big Walnut Cr.	35.64	3	4Ahx	4Ah	0	0	2020
05060001 16 01	Westerville Reservoir-Alum Creek	24.71	3	1d	4Ah	3	0	2020
05060001 16 02	Bliss Run-Alum Creek	52.92	3	4A	4A	0	0	2020
05060001 16 03	Town of Lockbourne-Alum Creek	22.77	3	4Ahx	1ht	0	0	2020
05060001 17 02	Headwaters Walnut Creek	42.62	1h	4A	4A	0	0	2020
05060001 17 05	Town of Carroll-Walnut Creek	37.12	1	4A	1t	0	0	2020
05060001 19 02	Spain Creek-Big Darby Creek	63.62	1	4A	4A	0	0	2029
05060001 19 05	Robinson Run-Big Darby Creek	43.86	1	4A	1d	0	0	2029
05060001 20 05	Barron Creek-Little Darby Creek	37.4	1	4A	4A	0	0	2029
05060001 20 06	Thomas Ditch-Little Darby Creek	36.2	1	4A	1d	0	0	2029
05060001 23 06	Town of Circleville-Scioto River	13.69	3	3	3	0	0	2025

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05060002 08 02	Buckeye Creek	19.07	3i	1h	4A	1	0	2021
05060002 10 05	Stony Creek-Scioto River	31.1	1	1	4n	0	0	2026
05060002 12 02	Headwaters Morgan Fork	21.03	1	1	4C	0	0	2026
05060002 12 03	Left Fork Morgan Fork-Morgan Fork	13.5	3	1	1	0	0	2026
05060002 13 01	No Name Creek	16.19	3	1	1	0	0	2026
05060002 13 04	Boswell Run-Scioto River	18.35	3	1	3	0	0	2026
05060002 14 03	Turkey Creek	16.91	3	4Ah	4n	0	0	2021
05060002 14 04	Turkey Run-South Fork Scioto Brush Creek	21.3	3	4Ah	4n	0	0	2021
05060002 14 05	Rocky Fork	22.91	3	4Ah	4n	0	0	2021
05060002 15 02	Rarden Creek	18.72	3	4Ah	4A	0	0	2021
05060002 15 03	Jaybird Branch-Scioto Brush Creek	16.45	3	4Ah	4A	0	0	2021
05060002 15 06	McCullough Creek	19.82	3	4Ah	4n	0	0	2021
05060002 16 05	Carroll Run-Scioto River	16.05	3	3	3	0	0	2026
05060003 01 03	Town of Washington Court House-Paint Creek	27.22	1	4A	4A	3i	0	2022
05060003 02 01	Headwaters Sugar Creek	44.2	3	4A	4A	0	0	2022
05060003 02 02	Camp Run-Sugar Creek	37.32	3	4Ah	4A	0	0	2022
05060003 03 02	Grassy Branch	13.13	3	1h	4A	0	0	2022
05060003 03 03	West Branch Rattlesnake Creek	24.78	3	4Ah	4A	0	0	2022
05060003 03 04	Headwaters Rattlesnake Creek	45.08	3	1d	4A	0	0	2022
05060003 03 05	Waddle Ditch-Rattlesnake Creek	25.24	3	4Ah	4A	0	0	2022
05060003 04 01	South Fork Lees Creek	19.97	3	4Ah	4A	0	0	2022
05060003 04 02	Middle Fork Lees Creek	17.2	3	1h	1	0	0	2022
05060003 04 03	Lees Creek	39.66	3	4A	4A	0	0	2022
05060003 04 04	Walnut Creek	14.86	3	4Ah	1	0	0	2022
05060003 04 05	Hardin Creek	21.28	3	1h	1	0	0	2022
05060003 04 07	Big Branch-Rattlesnake Creek	20.48	3i	4Ah	1	0	0	2022
05060003 05 01	South Fork Rocky Fork	10.36	1h	3	1	0	0	2022
05060003 05 03	Headwaters Rocky Fork	33.32	1h	1d	1	0	0	2022
05060003 05 04	Rocky Fork Lake-Rocky Fork	24.78	1h	3	3	0	0	2022

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05060003 05 05	Franklin Branch-Rocky Fork	30.58	1h	4Ah	4A	0	0	2022
05060003 06 03	Cliff Creek-Paint Creek	17.53	1	3	3	0	0	2022
05060003 07 01	Buckskin Creek	39.88	3	4Ah	4A	0	0	2022
05060003 07 02	Upper Twin Creek	14.3	3	4Ah	1	0	0	2022
05060003 07 03	Lower Twin Creek	16.6	3	4Ah	3i	0	0	2022
05060003 07 04	Sulphur Lick-Paint Creek	51.32	3	4Ah	4A	0	0	2022
05060003 08 01	Thompson Creek	10.41	3	4Ah	1	0	0	2022
05060003 08 02	Headwaters North Fork Paint Creek	15.57	3	1h	1	0	0	2022
05060003 08 03	Headwaters Compton Creek	31.28	3	4Ah	1	0	0	2022
05060003 08 04	Mills Branch-Compton Creek	28.79	3	4Ah	1	0	0	2022
05060003 08 05	Mud Run-North Fork Paint Creek	34.48	1	4Ah	1	0	0	2022
05060003 09 01	Herrod Creek	15.49	3	3	3	0	0	2022
05060003 09 02	Little Creek	23.25	3	4Ah	1	0	0	2022
05060003 09 03	Oldtown Run-North Fork Paint Creek	43.98	3	4A	4A	0	0	2022
05060003 09 04	Biers Run-North Fork Paint Creek	31.32	3i	4Ah	1	0	0	2022
05060003 10 01	Black Run	9.82	3	1h	1	0	0	2022
05060003 10 02	Ralston Run	13.78	3	4Ah	4A	0	0	2022
05060003 10 03	City of Chillicothe-Paint Creek	42.51	3	4Ah	1	0	0	2022
05080001 01 01	North Fork Great Miami River	21.7	1h	4Ah	1	0	0	2023
05080001 01 02	South Fork Great Miami River	51.35	1h	4Ah	1	0	0	2023
05080001 01 03	Indian Lake-Great Miami River	27.38	1	3	4A	0	0	2023
05080001 02 01	Willow Creek	14.31	3	1h	4A	0	0	2023
05080001 02 02	Headwaters Muchnippi Creek	20.78	3	4A	1	0	0	2023
05080001 02 03	Little Muchnippi Creek	35.81	3	4A	4A	0	0	2023
05080001 02 04	Calico Creek-Muchnippi Creek	18.21	3	1h	4A	0	0	2023
05080001 04 03	Stoney Creek	22.26	1	4Ah	1	0	0	2023
05080001 05 02	Mile Creek	62.72	3	4Ah	4A	0	0	2023
05080001 06 01	Nine Mile Creek	26.14	3	4Ah	1	0	0	2023
05080001 06 02	Painter Creek-Loramie Creek	27.14	3	4Ah	4A	0	0	2023
05080001 06 03	Turtle Creek	35.84	3	1h	4A	0	0	2023

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05080001 06 04	Mill Creek-Loramie Creek	27.77	3	4Ah	1	0	0	2023
05080001 08 01	Spring Creek	25.47	3	1h	1	0	0	2024
05080001 08 03	East Branch Lost Creek	14.35	3	1h	1	0	0	2024
05080001 08 04	Little Lost Creek-Lost Creek	31.74	3	1h	1	0	0	2024
05080001 08 05	Peter's Creek-Great Miami River	52.45	3	1h	1	0	0	2024
05080001 09 02	Headwaters Stillwater River	14.33	1h	3	4A	0	0	2028
05080001 17 01	East Fork Buck Creek	28.75	3	3	1ht	0	0	2018
05080001 17 02	Headwaters Buck Creek	30.53	3	3	1ht	0	0	2018
05080001 17 03	Sinking Creek	13.14	3i	3	1ht	0	0	2018
05080001 17 04	Beaver Creek	25.77	3	3	1ht	0	0	2018
05080001 17 05	Clarence J Brown Lake-Buck Creek	24.11	1	3	4Ah	0	0	2018
05080001 17 06	City of Springfield-Buck Creek	18.27	3	3	1ht	0	0	2018
05080001 19 04	City of Dayton-Mad River	22.58	3	3	4Ah	0	0	2018
05080002 01 05	Town of Oakwood-Great Miami River	26.47	3	3	3	0	0	2025
05080002 01 06	Opossum Creek-Great Miami River	19.01	3	1h	1	0	0	2025
05080002 02 05	Lesley Run-Twin Creek	41.61	1h	4A	4A	0	0	2019
05080002 03 06	Town of Germantown-Twin Creek	22.34	1h	1h	1	0	0	2019
05080002 04 02	Mouth Bear Creek	21.14	3	1h	1	0	0	2025
05080002 04 04	Dry Run-Great Miami River	32.47	3	3	3	0	0	2025
05080002 05 01	Headwaters Sevenmile Creek	42.14	1h	3	1h	0	0	2020
05080002 05 04	Rush Run-Sevenmile Creek	27.25	1	3	1h	0	0	2020
05080002 05 05	Ninemile Creek-Sevenmile Creek	17	1	3	1h	0	0	2020
05080002 06 01	Headwaters Four Mile Creek	38.31	1h	1h	1	0	0	2020
05080002 06 03	East Fork Four Mile Creek-Four Mile Creek	16.46	1h	1h	1	0	0	2020
05080002 07 02	Browns Run-Great Miami River	32.02	3	1h	1	0	0	2025
05080002 07 06	Town of New Miami-Great Miami River	30.68	3i	3	3	0	0	2025
05080002 08 02	Brandywine Creek-Indian Creek	18.32	3	3	3	0	0	2019
05080002 09 06	Jordan Creek-Great Miami River	22.74	3	3	3	0	0	2025
05080002 09 07	Doublelick Run-Great Miami River	15.73	3	3	3	0	0	2025
05080003 07 01	Headwaters Middle Fork East Fork Whitewater River	29.12	3	3	3x	0	0	2017

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05080003 07 03	Mud Creek-Middle Fork East Fork Whitewater River	19.55	3	3	3x	0	0	2017
05080003 07 07	Short Creek-East Fork Whitewater River	16.83	3	3	3x	0	0	2017
05080003 07 08	Elkhorn Creek	29.21	3	3	3x	0	0	2017
05080003 08 07	Headwaters Dry Fork Whitewater River	16.27	3	3	1hx	0	0	2017
05080003 08 08	Howard Creek-Dry Fork Whitewater River	42.63	3	3	4n	0	0	2017
05080003 08 09	Lee Creek-Dry Fork Whitewater River	22.67	3	3	1hx	0	0	2017
05090101 01 01	Chickamauga Creek	30.95	3	3	3x	0	0	2016
05090101 01 03	Long Run-Ohio River	25.97	3	3	3x	0	0	2016
05090101 02 01	East Branch Raccoon Creek	20.12	3	3	1	0	0	2016
05090101 07 03	Swan Creek	16.75	3	3	3x	0	0	2016
05090101 07 04	Flatfoot Creek-Ohio River	22.59	3	3	3x	0	0	2016
05090101 07 06	Little Indian Guyan Creek	14.94	3	3	3x	0	0	2016
05090101 07 07	Johns Creek-Indian Guyan Creek	33.77	3	3	3x	0	0	2016
05090101 07 08	Wolf Creek-Indian Guyan Creek	28.46	3	3	3x	0	0	2016
05090101 07 09	Paddy Creek-Ohio River	70.23	3	3	3x	0	0	2016
05090101 08 01	Dirtyface Creek	13.46	3	3	3x	0	0	2016
05090101 08 03	Headwaters Symmes Creek	56.44	3	3	3x	0	0	2016
05090101 09 01	Sand Fork	42.42	3	1h	3x	0	0	2016
05090101 09 02	Buffalo Creek	17.56	3	3	3x	0	0	2016
05090101 09 03	Camp Creek-Symmes Creek	40.24	1	3	3x	0	0	2016
05090101 10 01	Johns Creek	22.68	3	3	3x	0	0	2016
05090101 10 02	Long Creek	15.56	3	3	3x	0	0	2016
05090101 10 03	Pigeon Creek-Symmes Creek	18.51	1	3	3x	0	0	2016
05090101 10 04	Aaron Creek-Symmes Creek	58.34	1	3	3x	0	0	2016
05090101 10 05	McKinney Creek-Symmes Creek	22.08	3	3	3x	0	0	2016
05090101 10 07	Buffalo Creek-Ohio River	19.44	3	3	3x	0	0	2016
05090103 01 05	Pond Run-Ohio River	44.01	3	1h	3i	0	0	2025
05090103 05 03	Holland Fork	34.74	3	1h	1	0	0	2025
05090201 02 01	Headwaters Turkey Creek	16.31	1	3	4n	0	0	2016
05090201 02 02	Odell Creek-Turkey Creek	30.95	3	3	1	0	0	2016

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05090201 03 01	Headwaters Ohio Brush Creek	25.38	3	1h	4n	0	0	2022
05090201 03 04	Middle Fork Ohio Brush Creek	20.43	3	1h	1	0	0	2022
05090201 03 05	Flat Run-Ohio Brush Creek	24.87	3	1h	4n	0	0	2022
05090201 05 01	Little East Fork-Ohio Brush Creek	46.89	1	1	4n	0	0	2022
05090201 05 02	Lick Fork	31.7	1	1h	4n	0	0	2022
05090201 05 03	Bundle Run-Ohio Brush Creek	17.23	1h	1h	1	0	0	2022
05090201 05 04	Cedar Run-Ohio Brush Creek	26.69	3	1h	1	0	0	2022
05090201 06 01	Crooked Creek-Ohio River	58.56	3	3	3x	0	0	2016
05090201 06 05	Lawrence Creek-Ohio River	58.26	3	3	3x	0	0	2016
05090201 09 01	Headwaters East Fork Whiteoak Creek	36.39	3	4Ah	1	0	0	2021
05090201 09 02	Slabcamp Run-East Fork Whiteoak Creek	43.72	3	4A	4A	0	0	2021
05090201 09 03	Little North Fork-North Fork Whiteoak Creek	37.06	3	4Ah	4A	0	0	2021
05090201 10 01	Sterling Run	29.64	3i	4A	4A	4A	0	2021
05090201 10 02	Miranda Run-Whiteoak Creek	39.8	3	1h	4A	0	0	2021
05090201 11 02	Turtle Creek-Ohio River	21.98	3	3	3	0	0	2029
05090201 11 03	West Branch Bullskin Creek	27.58	3	3	1	0	0	2029
05090201 11 07	Little Indian Creek-Ohio River	24.45	3	1	1	0	0	2029
05090201 12 01	Headwaters Big Indian Creek	21.52	3	1	4n	0	0	2029
05090201 12 02	North Fork Indian Creek-Big Indian Creek	18.42	3	1	1	0	0	2029
05090201 12 03	Boat Run-Ohio River	15.86	3	1	1	0	0	2029
05090202 04 04	Middle Caesar Creek	30.09	1	1	4n	0	0	2026
05090202 06 01	Dutch Creek	14.84	1h	3	1	0	0	2022
05090202 06 02	Headwaters Todd Fork	33.44	1h	3	1	0	0	2022
05090202 06 03	Lytle Creek	20.41	1h	4A	4A	0	0	2022
05090202 06 05	Wilson Creek-Cowan Creek	22.08	1	1h	4n	0	0	2022
05090202 06 06	Little Creek-Todd Fork	24.39	1h	1h	1	0	0	2022
05090202 07 01	East Fork Todd Fork	39.64	3i	4Ah	4n	0	0	2022
05090202 07 04	Lick Run-Todd Fork	35.69	3	4Ah	1	0	0	2022
05090202 08 01	Ferris Run-Little Miami River	30.17	3	3	3	0	0	2022
05090202 08 02	Little Muddy Creek	20.58	3	3	4A	0	0	2022

Section L4. Section 303(d) List of Prioritized Impaired Waters

Assessment Unit	Assessment Unit Name	Sq. Mi. in Ohio	Human Health	Recre-ation	Aquatic Life	PDW Supply	Priority Points	Next Field Monitoring
05090202 08 04	Halls Creek-Little Miami River	20.47	3	3	3	0	0	2022
05090202 14 03	Horner Run-Little Miami River	21.47	3	3	3	0	0	2022
05090203 02 01	Town of Newport-Ohio River	16.82	3	3	3	0	0	2029
05090203 02 04	Garrison Creek-Ohio River	25.91	3	3	3	0	0	2029
05120101 03 01	Little Beaver Creek	14.1	3	4Ahx	4Ah	0	0	2022
05120101 03 02	Hardin Creek-Beaver Creek	19.25	3	4A	4Ah	0	0	2022
05120101 03 03	Prairie Creek-Beaver Creek	24.65	3	4Ahx	4Ah	0	0	2022
05120101 04 01	Wilson Creek-Limberlost Creek	1.7	3	3	3	0	0	2022
05090101 90 01	Raccoon Creek Mainstem (Little Raccoon Creek to mouth)	681	3i	3i	1	0	0	2016

L5. Category 4B Demonstrations Contained in Approved Ohio TMDLs to Date

Ohio EPA expects to use the 4B alternative in conjunction with total maximum daily loads (TMDLs) to efficiently address water quality impairments in the future. Though the 4B category does not currently appear in Ohio's 303(d) list, the concept of a 4B alternative is used to address certain impairments. Because Ohio EPA typically completes TMDLs on a watershed basis, it makes sense to include discussion of 4B demonstrations in TMDL reports as approval of a TMDL is sought, then to report on progress in Integrated Reports. As new 4B demonstrations accumulate, they will be collected into future Integrated Reports. Progress on individual 4B projects will be reported in subsequent Integrated Reports until the impairment is resolved or until a decision is made that the 4B will not be sufficient to address the impairment and a TMDL is scheduled.

This section presents the 4B discussions as they appeared in the respective TMDL reports, with updates on current status. Text that is not original to this report appears in a lighter text color; plans and dates are not changed from the original so some text may appear to be outdated. The table below shows the locations of the original 4B demonstrations as included with TMDL reports and where updates are included in this report.

Name of Watershed	Location of 4B in Report	Date of TMDL Approval	Updated Sections in 2016 IR	Page Number
Salt Creek Watershed (Scioto River basin)	Appendix D	8/12/2009	5.1.1.3	L5-6
White Oak Creek Watershed	Appendix H	2/25/2010	5.2.1.3	L5-9
Twin Creek Watershed	Appendix B	3/4/2010	5.2.2.3	L5-13
Walnut Creek Watershed	Appendix B	5/4/2010	5.2.3.3	L5-18
Great Miami River (upper) Watershed	Appendix E	3/26/2012	5.3.1.2	L5-28

L5.1 Projects included in the 2010 Integrated Report

Prior to the 2010 Integrated Report, Ohio submitted one 4B alternative as part of an approved TMDL, for Salt Lick Creek (Salt Creek Watershed TMDL Report). Together with TMDLs approved for other impairments to the aquatic life use, the 4B work should bring Little Salt Creek into attainment with water quality standards.

L5.1.1 Salt Lick Creek (Salt Creek, Scioto River Watershed)

The main stem of Salt Lick Creek (in assessment unit 05060002 090[1]) was identified as impaired by nutrients, specifically total phosphorus, during the field sampling in 2005. Upstream of the wastewater treatment plant (WWTP) in the City of Jackson, the stream was in attainment of its aquatic life use. Downstream of the treatment plant, the aquatic life in the stream was impaired. Analysis of nutrients upstream and downstream of the WWTP indicated that the large increase in nutrients from the WWTP was likely the largest contributor to impairment in this portion of the stream. Prompt action was taken to address this through the National Pollutant Discharge Elimination System (NPDES) permit renewal.

[1] The Salt Creek TMDL was approved using the larger, HUC 11-size assessment units. The 4B actions will affect two HUC 12-size assessment units: 05060002 08 01 and 08 03.

Ohio EPA proposes that this impairment be handled through a category 4B alternative instead of a TMDL. Further details are discussed below. Additional information is available in the main text of the TMDL and in the forthcoming biological and water quality study publication.

Identification of segment and statement of problem causing the impairment

The cause of aquatic life use impairment was identified to be a failing sewage collection system, poor nutrient (specifically phosphorus) removal from the City of Jackson WWTP and by-passes of treatment at the WWTP. In-stream levels for phosphorus at the two uppermost Salt Lick Creek sampling locations ranged from 0.01 mg/L to 0.11 mg/L. The sample location immediately downstream from the City of Jackson's WWTP ranged from 1.37 mg/L to 4.11 mg/L. The WWTP was not sampled for chemistry during the survey. At the time of the survey the City of Jackson was not required to sample for nor had a limit for phosphorus. Ammonia results from stream samples and WWTP sample results show very little nutrient contribution from the WWTP. Attachment 1 shows that the biology scores decrease downstream of the City of Jackson's WWTP discharge.

OAC 3745-01-07, Table 7-11 states in footnote c: "Total phosphorus as P shall be limited to the extent necessary to prevent nuisance growths of algae, weeds, and slimes that result in a violation of the water quality criteria set forth in paragraph (E) of rule 3745-1-04 of the Administrative Code or, for public water supplies, that result in taste or odor problems. In areas where such nuisance growths exist, phosphorus discharges from point sources determined significant by the director shall not exceed a daily average of one milligram per liter as total P, or such stricter requirements as may be imposed by the director in accordance with the international joint commission (United States-Canada agreement)." During initial investigation of a fish kill on Salt Lick Creek in 2003, Ohio EPA observed excessive white stringy slime fungus growing at the City of Jackson's WWTP discharge point.

Poor sanitary sewer operation and maintenance leading to sewer breaks and overflows, high nutrient discharges from WWTP and by-passes at the WWTP have all contributed to poor aquatic performance. No stream flow was taken during sampling; thus loadings are not available. However, in-stream phosphorus concentrations increased from 0.06 mg/L upstream of the WWTP to 2.42 mg/L immediately downstream of the WWTP.

Description of pollution controls and how they will achieve water quality standards

The City of Jackson operates a sewer collection system and a wastewater treatment facility that handles domestic and industrial sewage for a population of about 6,000. Page 14 of the Jackson WWTP Fact Sheet (FS) states that phosphorus limits are required (see FS http://www.epa.state.oh.us/dsw/permits/doc/0PD00008.fs.pdf [2]. The City of Jackson is required by its NPDES permit (OH0020834—see permit http://www.epa.state.oh.us/dsw/permits/doc/0PD00008.pdf [3] to achieve a limit of 1.0 mg/L (monthly average) for phosphorus and eliminate all by-passes at the WWTP by August 1, 2009. The City of J a c k s o n is required, under Consent Order (Case No. 07C1V190 – see http://www.epa.state.oh.us/dsw/enforcement/JacksonCO2007.pdf [4]to eliminate all sewer overflows by October 1, 2009; operate and maintain sewer collection system by implementing a

[2] This Web page has changed to http://wwwapp.epa.ohio.gov/dsw/permits/doc/0PD00008.fs.pdf.
[3] This Web page has changed to http://wwwapp.epa.ohio.gov/dsw/permits/doc/0PD00008.pdf.
[4] This Web page has changed to http://www.epa.ohio.gov/portals/35/enforcement/JacksonCO2007.pdf.

Capacity Management, Operation and Maintenance plan by December 31, 2008; develop an Overflow Emergency Response Plan by July 1, 2008, that identifies measures to protect public health and the environment; separate all storm sewers from sanitary sewers by April 1, 2009; and if problems persist then the City of Jackson must develop a System Evaluation and Capacity Assurance Plan to provide adequate capacity to convey and treat base and peak flows for all parts of Jackson sewer system by April 1, 2011. If the impairment continues after the 1 mg/L phosphorus limit is achieved and before the NPDES permit expires, then the limit can be lowered per OAC 3745-01-07.

Point source loadings for phosphorus associated with proper operation of the systems should be no more than 14.3 kg/day. There are no known nonpoint sources.

An estimate or projection of the time when WQS will be met

After August 1, 2009 the phosphorus limit should be met and by-passing treatment should be eliminated. The water body is expected to respond to the load reduction, but recovery will not be instantaneous. Ohio EPA will monitor the stream for recovery.

Schedule for implementing pollution controls

The City of Jackson is currently in the process of a WWTP expansion that will include advanced treatment, ability to handle higher flows and eliminate overflows and by-passes by August 1, 2009. The City of Jackson is required to provide annual status reports to Ohio EPA every August first.

If they are unsuccessful, Ohio EPA will hold the City in contempt of the consent order and initiate enforcement on non-compliance with the NPDES permit schedule and effluent limits.

Ohio EPA has approved the NPDES permit with compliance schedule to meet a phosphorus limit of 1.0 mg/L.

Monitoring plan to track effectiveness of pollution controls

The City of Jackson is required to submit an annual status report to Ohio EPA every August first and submit monthly Discharge Monitoring Reports for effluent quality from the WWTP.

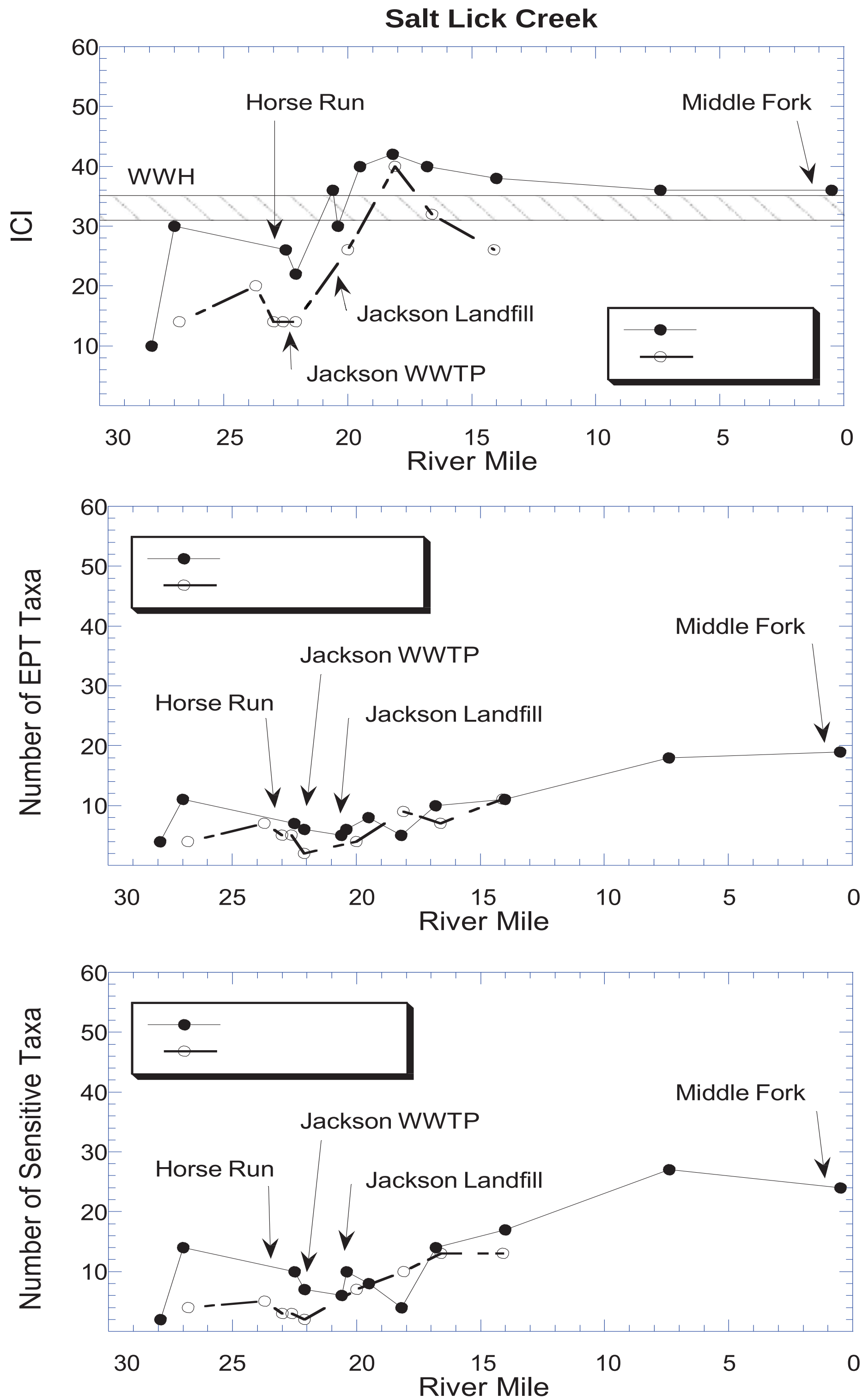
Prior to the NPDES permit expiration on January 31, 2011, Ohio EPA will sample the impaired section of Salt Lick Creek for chemistry, fish and macroinvertebrates (summer of 2010). The chemistry will be sampled at four locations and five sampling events will be completed. The fish will be sampled at four locations with two passes each. The macroinvertebrates will be sampled at four locations once per standard protocols. The sampling will take place during the summer/fall sampling season with analysis by Ohio EPA's laboratory and reporting to Southeast District Office (SEDO[5]) DSW Manager, DSW NPDES Manager, and TMDL Coordination.

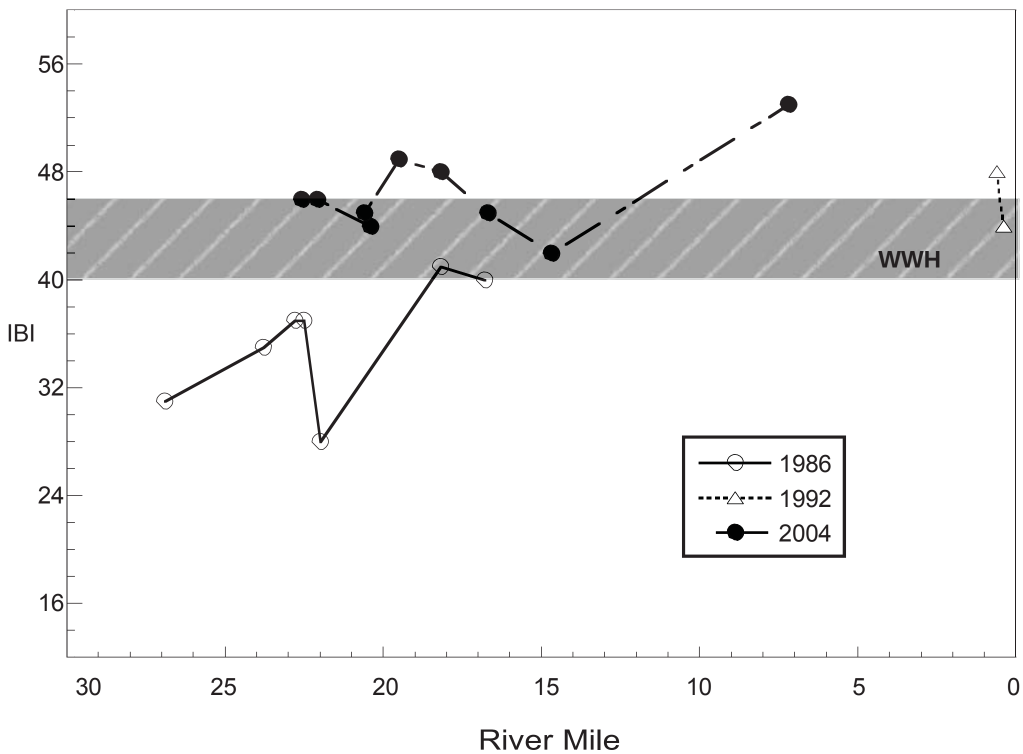
The City of Jackson, SEDO Water Quality (WQ) staff and Ecological Assessment Section staff will do the monitoring.

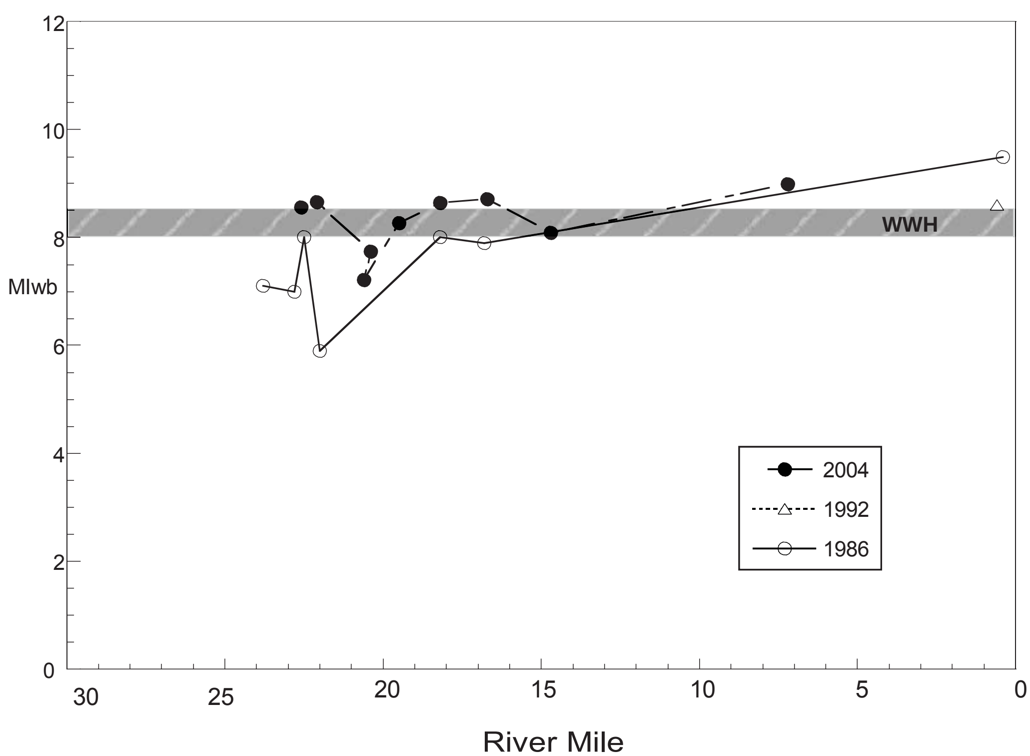
Commitment to revise pollution controls, as necessary

Pollution controls will be revised by SEDO WQ and NPDES staff, supported by SEDO DSW Manager. Ohio EPA will report on the progress of any approved 4B in future 303(d) lists.

Attachment 1







Historical trend for IBI and MIwb for Salt Lick Creek mainstem.

L5.1.1.1 First Report on Salt Lick Creek 4B Demonstration (2012 Integrated Report)

In 2011, four sites on Salt Lick Creek were sampled for macroinvertebrates and three sites for fish. All three fish sites sampled (upstream from the Jackson WWTP at river mile 22.6; immediately downstream from the Jackson WWTP effluent at river mile 22.0; and further downstream at river mile 18.2) appear to be doing well but have not yet been completely analyzed. Macroinvertebrate samples are still being analyzed. Aquatic life attainment status will be reported in the 2014 IR. When available, data will be reported on Ohio EPA's Interactive Maps web site (http://www.epa.ohio.gov/dsw/gis/index.aspx).

L5.1.1.2 Second Report on Salt Lick Creek 4B Demonstration (2014 Integrated Report)

In 2011, biological and habitat sampling was conducted in Salt Lick Creek upstream from, near field to, and downstream from the Jackson WWTP, which has had past issues with collection system failures, and the old Jackson city landfill; impacts on resource quality and impairment of the designated WWH aquatic life use were documented in a prior 2004 survey. Four sites spanning the previously impaired reach were sampled for macroinvertebrates and three sites for fish; results and attainment status are shown in the table below. At the three sites where both fish and macroinvertebrates were collected, full attainment of the WWH use was realized. At the fourth site where only macroinvertebrates were collected, a community assessed as marginally good achieved ecoregional WWH expectations.

River Mile	Stream Name	IBI	MIwb	ICI	Macroinvertebrate Narrative	QHEI	Attainment Status
22.55	Salt Lick Creek at Jackson @ High St.	46	8.98		Marginally good	56.00	Full
21.90	Salt Lick Creek dst. Jackson WWTP	44	8.20	36		73.50	Full
20.30	Salt Lick Creek adj. landfill	-	-	-	Marginally good		-
18.12	Salt Lick Creek east of Lake Katherine @ Rock Run Rd.	46	8.31	50		76.80	Full

L5.1.1.3 Third Report on Salt Lick Creek 4B Demonstration (2016 Integrated Report)

The 2011 biological and habitat data documented full aquatic life use recovery at the previously impaired sites. The impairment is considered resolved. Ohio EPA reports progress on individual 4B projects until the impairment is resolved; progress on the Salt Lick Creek 4B will not be recorded in future Integrated Reports.

L5.2 Projects included in the 2012 Integrated Report

After completion of the 2010 Integrated Report and before completion of the 2014 Integrated Report, Ohio submitted three 4B alternatives as part of approved TMDLs: Town Run (White Oak Creek Watershed TMDL Report); Twin Creek (Twin Creek Watershed TMDL Report); and Sycamore Creek (Walnut Creek Watershed TMDL Report). Together with TMDLs approved for other impairments to the aquatic life use, the 4B work should bring the streams into attainment with water quality standards.

L5.2.1 Town Run (White Oak Creek Watershed)

Impairment of biological water quality standards and high ammonia concentrations have been measured in Town Run, a tributary to White Oak Creek at river mile (RM) 6.95. Town Run is a high gradient bedrock substrate headwater stream that is fed by ground water. The City of Georgetown WWTP discharges to Town Run at RM 0.80. The biological impairment and high ammonia concentrations are resulting from the Georgetown WWTP effluent discharge. Ohio EPA proposes that this impairment be handled through a category 4B alternative instead of a total maximum daily load (TMDL). Further details are discussed below. Additional information is available in the main text of the TMDL and in the biological and water quality study publication.

Ohio EPA is addressing the phosphorus and nitrate-nitrite impairments via a TMDL analysis expected to be completed in 2009.

Identification of segment and statement of problem causing the impairment

Ohio EPA measured the water quality in the White Oak Creek watershed in 2006, collecting biological, chemical and physical data. The following paragraph from Ohio EPA's water quality report summarizes the problems observed in Town Run:

"Biological sampling in Town Run (RM 0.9 in 2008) found a marginally good community of macroinvertebrates and a reproducing population of the cold water indicator two-lined salamander upstream from the Georgetown WWTP discharge (RM 0.80). Downstream from the WWTP discharge (RM 0.7 in 2008) the macroinvertebrate community was very poor and there was no observed reproduction of the two-lined salamander. High concentrations of Ammonia-N (median of 3.24 mg/L), Phosphorus-T (median of 3.04 mg/L), and Nitrate-Nitrite-N (median of 6.39 mg/L) were recorded downstream from the WWTP discharge in 2006."
(http://www.epa.ohio.gov/portals/35/documents/WhiteOakCreekTSD2006.pdf, p. 9)

During Ohio EPA's water quality survey of the White Oak Creek watershed in 2006, five sets of chemical samples were collected at sites upstream and downstream of the Georgetown WWTP. Upstream of the WWTP, the median value for ammonia was 0.05 mg/L. Downstream of the WWTP, the ammonia value was 3.24 mg/L. The median ammonia value of the Georgetown WWTP effluent was 4.07 mg/L.

Biological impact was significant, resulting in a listing on the 303(d) list. Upstream of the WWTP, Town Run is fully attaining the Aquatic Life Use, but downstream of the WWTP the use is not attained.

Description of pollution controls and how they will achieve water quality standards

Town Run is effluent-dominated downstream from the Georgetown WWTP. The drainage area upstream of the WWTP discharge is only 1.3 square miles.

The median flow of the Georgetown WWTP from 2002-2006 was 0.47 million gallons per day (MGD) with 23.8 percent (420/1764) of the flow dates being over the facility's design capacity of 0.80 MGD.

The critical period for ammonia in such an effluent-dominated stream is late summer when ambient temperatures are highest and stream flows are lowest. Calculating a load to meet water quality standards during the summer is protective of other time periods. A winter load is calculated to meet the

needs of Ohio EPA's permitting program.

By reducing the effluent concentration of ammonia from Georgetown, water quality standards for ammonia and the Aquatic Life Use in Town Run are expected to be met.

The nonpoint source load is zero because of the limited drainage area above the WWTP's discharge point. At the critical condition, no upstream flow would be expected.

Loadings for point sources can be calculated using a mass-balance equation. In this case, since upstream flow equals zero, the allocation for the Georgetown WWTP is equal to the water quality standards (WQS). The ammonia WQS for exceptional warmwater habitat (EWH)/coldwater habitat (CWH) is 0.6 mg/L during summer and 1.93 mg/L during winter.

Thus, the load allocated to the Georgetown WWTP = (WQS) x (Effluent flow) x (conversion factor):

Summer: 0.6 mg/L x 0.8 MGD x (factor) = 1.82 kg/day
Winter: 1.93 mg/L x 0.8 MGD x (factor) = 5.85 kg/day

An estimate or projection of the time when WQS will be met

After the Georgetown WWTP meets the new ammonia permit limit (by November 2014), the ammonia limit should be met. The water body is expected to respond to the load reduction, but recovery will not be instantaneous. Ohio EPA will monitor the stream for recovery.

Schedule for implementing pollution controls

The Georgetown NPDES permit expires on February 28, 2010. Prior to that date, Ohio EPA will issue a new permit with a 30-day average limit on effluent ammonia of 0.6 mg/L (summer) and 1.93 mg/L (winter).

Officials at the Georgetown WWTP have contracted with an engineering firm and they have produced a plan to upgrade the WWTP to achieve compliance with the new ammonia limits. The WWTP upgrade will be completed by November 2014.

Ohio EPA will monitor Georgetown's progress toward meeting the permit limits by following up on the construction activity and reviewing monthly effluent reports.

Monitoring plan to track effectiveness of pollution controls

As a part of its NPDES permit, the Georgetown WWTP measures and reports ammonia concentrations in its effluent and in Town Run upstream and downstream of its discharge point. The sampling will be conducted twice per week and reported monthly. The facility's monthly discharge monitoring reports are reviewed by permit staff in Ohio EPA's Southwest District Office. Ohio EPA staff will also conduct facility inspections approximately annually.

After the Georgetown ammonia reductions have been in place for at least one year, Ohio EPA will revisit the area to determine if progress toward meeting the Aquatic Life Use is being made. This work would follow Ohio EPA's protocol for sampling the aquatic biology and chemistry.

Commitment to revise pollution controls, as necessary

The SWDO surface water manager will initiate a reexamination of the implementation strategy if significant progress is not being made by the end of the next NPDES permit cycle for Georgetown.

Ohio EPA will report on the progress of any approved 4B in future 303(d) lists.

L6.2.1.1 First Report on Town Run 4B Demonstration (2012 Integrated Report)

A permit was issued to the Georgetown WWTP effective on September 1, 2010. Final effluent limitations for ammonia are 0.60 mg/L (summer monthly average) and 1.76 mg/L (winter monthly average). Those limits must be met beginning on September 1, 2014.

L6.2.1.2 Second Report on Town Run 4B Demonstration (2014 Integrated Report)

The Georgetown WWTP is under construction in fall 2013 to make improvements to meet the new nitrogen-ammonia and total phosphorus limits. The upgrade is scheduled to be completed by September 1, 2014, but upgrades are currently ahead of schedule. Follow-up sampling will take place in 2015 or 2016, so results will likely be available for the 2018 Integrated Report.

L5.2.1.3 Third Report on Town Run 4B Demonstration (2016 Integrated Report)

The Georgetown WWTP did not complete its scheduled upgrades by September 1, 2014, due to contractor issues. The WWTP upgrades were completed on July 1, 2015, and all treatment improvements should help meet the nitrogen-ammonia and total phosphorus limits. Follow up sampling will take place in 2016.

L5.2.2 Twin Creek

The main stem of Twin Creek (in assessment unit 05080002 030) was identified as impaired by total phosphorus during the field sampling in 2005; organic enrichment was later added to the list of causes upon further investigation in the summer of 2009. Upstream of the WWTP in the City of Lewisburg, the stream was in attainment of its aquatic life use. Downstream of the treatment plant, the aquatic life in the stream was partially supporting the use. The City of Lewisburg WWTP discharges to Twin Creek at river mile (RM) 35.2. No impairment to Twin Creek upstream of Lewisburg or downstream at RM 33.6 was found. The biological impairment (between the WWTP and RM 33.6) is resulting from the Lewisburg WWTP effluent discharge. Ohio EPA proposes that this impairment be handled through a category 4B alternative instead of a total maximum daily load (TMDL). Further details are discussed below. Additional information is available in the main text of the TMDL and in the forthcoming biological and water quality study publication.

Identification of segment and statement of problem causing the impairment

An Invertebrate Community Index (ICI) of 38 was garnered at RM 34.9, which was below the Exceptional Warmwater Habitat (EWH) criterion. In 2005, excessive phosphorus due to either the Lewisburg WWTP, herbicide runoff from an upstream municipal park, or contaminated storm water was considered potential contributors to this impairment. However, new information obtained during an inspection of the Lewisburg WWTP in September 2009 revealed that biological solids were being discharged directly

into Twin Creek from the wastewater plant. Gray and brown sewage sludge was observed in Twin Creek from Lewisburg's outfall downstream to at least the Salem Road Bridge, with thick algal mats coating the heaviest deposits. Black anoxic muck was also observed under many of the substrates. Because of these new findings, it is apparent that nutrient enrichment was a secondary cause of impairment to Twin Creek at RM 34.9. Organic enrichment attributable to improper solids management at the Lewisburg WWTP is now considered the primary cause of impairment to the macroinvertebrate community at RM 34.9.

Further information regarding the 2005 findings is available in the Biological and Water Quality Study of Twin Creek and Select Tributaries 2005, available on Ohio EPA web site (http://www.epa.ohio.gov/portals/35/documents/TwinCreek2007TSD.pdf). This report will be amended to reflect the 2009 observations.

Ohio EPA included nutrient enrichment for this assessment unit in the 2008 Integrated Report (303(d) list), available at (http://www.epa.ohio.gov/dsw/tmdl/2008IntReport/2008OhioIntegratedReport.aspx). The 2010 Integrated Report will add organic enrichment as an impairment cause for this assessment unit.

The primary issue with the Lewisburg WWTP is that biological solids or sludge is making its way into the stream resulting in the stream conditions described above. Sludge in the creek will contribute nutrients (phosphorus) and bacteria as well as smothering the substrate. Biological solids are largely made up of sewage treatment micro-organisms, living and dead. Micro-organisms contain phosphorus compounds (e.g., nucleic acids, ADP, ATP). Biosolids from WWTPs are frequently used as an agricultural soil amendment with some fertilizer value. Lewisburg's 2008 annual sewage sludge report included the following analyses results (on a dry weight basis): TKN = 35,000 mg/Kg; NH_3-N = 8590 mg/Kg; and phosphorus = 15,900 mg/Kg.

This information demonstrates there is a nutrient content to Lewisburg's sludge.

In September 2009 there appeared to be both structural and operational problems. Clarified water was overflowing only portions of the clarifier weirs; this may have been caused by the weirs not being level and sections of the weir being clogged with algae. The net result was that the clarifiers were being short circuited. Compounding the problem was the fact that Lewisburg was not wasting sufficient amounts of sludge from the clarifiers to the sludge digesters. This resulted in old sludge denitrifying and floating to the surface of the clarifiers, which was then discharged to Twin Creek. Plant operating logs also documented difficulty in balancing flow between the two clarifiers during rain, which compromised clarifier performance still further. The appearance of the aeration tanks indicated that the mixed liquor suspended solids were being maintained at higher levels than necessary and that the biological solids in the tank were old.

Description of pollution controls and how they will achieve water quality standards

The Village of Lewisburg operates a sewer collection system and a wastewater treatment facility that handles domestic and industrial sewage for a population of about 1,800. The Lewisburg WWTP holds a NPDES permit (1PB00019*HD).

Lewisburg has been reporting substantial compliance with its NPDES effluent limits over the life of the current permit. Ohio EPA now believes that compositing effluent samples using multiple grab samples

(as allowed by the NPDES permit) did not provide a true reflection of effluent quality. Recent inspections have also revealed quality control issues with the sampling and analyses, casting doubt on the reported effluent data.

Lewisburg has been required in inspection reports and Notices of Violation to take actions to eliminate the problems resulting in discharge of solids to Twin Creek. The Village has since utilized the assistance of Ohio EPA's Compliance Assistance Unit and has engaged an engineering firm that is reviewing plant operations. Lewisburg began implementing changes recommended by the Ohio EPA's Compliance Assistance Unit in November 2009.

Ohio EPA anticipates that the operational problems contributing to the discharge of solids can be resolved well before the NPDES permit is renewed in April 2010. Ohio EPA NPDES permits staff from the Southwest District office will closely monitor operational changes.

The draft renewal of the Lewisburg WWTP NPDES permit, (scheduled for issuance April 1, 2010) contains additional requirements that will address the impairment in Twin Creek downstream of the WWTP discharge. Ohio EPA intends to revisit the Twin Creek sampling sites in Lewisburg in September 2011. If the operational improvements have been properly implemented and yet the ICI at RM 34.9 cannot be demonstrated to comply with EWH criteria due to organic enrichment from the WWTP, Lewisburg will be required by a modification to its NPDES permit to comply with a schedule that leads to compliance with an initial total phosphorus limit of 1.0 mg/L by April 2015.

A complicating factor is that Preble County, at the request of the Village of Lewisburg, cleared bank vegetation and removed gravel bars and woody debris from the creek in the vicinity of RM 34.9 during the summer of 2009. This work was done to protect the Knapke Lane bridge pier and reduce bank erosion. It is unlikely that the target ICI score can be attained at that location unless the creek habitat is restored.

A loading analysis to address the organic enrichment impairment is not necessary given the scope of the operational problems at the Lewisburg WWTP and the ability of the facility to correct the problem. Although it is difficult to predict how much of the secondary nutrient enrichment problem is associated with the operational problems, a simple analysis of chemical data provides guidance on point source loading.

The 2005 data collected in Twin Creek by Ohio EPA show a significant change in total phosphorus concentration at the WWTP's entry into the stream. The median in-stream concentration of total phosphorus upstream of Lewisburg's outfall was 0.038 mg/L. The median in-stream concentration downstream of Lewisburg was 0.239 mg/L. The exceptional warmwater habitat (EWH) in-stream target from *Association Between Nutrients, Habitat, and the Aquatic Biota of Ohio Rivers and Streams* is 0.08 mg/L (http://www.epa.ohio.gov/portals/35/documents/assoc_load.pdf).
A simple loading analysis using the five sets of samples collected in 2005 yields the following total phosphorus loads:

Stream capacity (based on 0.08 mg/L target) = 1.303 kg/d Margin of safety (5 percent) = 0.065 kg/d Load allocation (from nonpoint sources) = 0.856 kg/d Wasteload allocation (Lewisburg WWTP) = 0.382 kg/d

A wasteload allocation of 0.382 kg/d equates to an effluent concentration of 0.39 mg/L total phosphorus

at the WWTP's design flow. The 95th percentile of effluent total phosphorus reported by Lewisburg over the current permit is 3.69 mg/L, although there is uncertainty because of concerns with laboratory practices.

Ohio EPA intends to apply an initial phosphorus limit of 1.0 mg/L that would be triggered if fixing the WWTP's operational problems fails to result in attainment of WQS. While the loading analysis results indicate that this limit will not meet the phosphorus target concentration, it does represent a significant (approximately 72 percent) reduction in phosphorus load from the Lewisburg WWTP. This limit should provide enough in-stream nutrient reduction to improve aquatic life while imposing achievable NPDES limits. Any further reduction in effluent limits should be evaluated after this limit is being attained and an evaluation of the biological condition of the stream has been completed.

An estimate or projection of the time when WQS will be met

The next NPDES permit for Lewisburg's WWTP will be issued in 2010. Ohio EPA anticipates that Lewisburg will be able to eliminate the discharge of biosolids to the creek before the permit is renewed. This will significantly reduce the solids and nutrient load to the creek. Ohio EPA expects that the stream will respond to improved operation within two years of making the changes.

Ohio EPA proposes to measure the ICI at RM 34.9 by September 2011. If the ICI does not comply with EWH criterion due to organic enrichment at that time Lewisburg will be given three years to come into compliance with a permit limit for TP of 1.0 mg/L (that is, by April 2015).

Schedule for implementing pollution controls

Any compliance schedule placed in the NPDES permit will allow three years (2012-2015) to implement new controls to reduce TP in effluent if the ICI score is not in attainment by September 2011. It is expected that operational improvements to reduce organic enrichment and, if needed, effluent controls to reduce TP, will sufficiently improve water quality within five years such that the macroinvertebrate community will be able to recover to full attainment.

Monitoring plan to track effectiveness of pollution controls

The City of Lewisburg WWTP is required to submit monthly Discharge Monitoring Reports for effluent quality from the WWTP and upstream and downstream of its discharge point.

The renewed permit will require 24-hour flow composited effluent sampling at Lewisburg, which will provide a much improved picture of effluent quality. The operations assistance provided by Ohio EPA to the WWTP will include attention to quality control issues so that concerns with past facility monitoring will be resolved.

Following Ohio EPA's Permit Guidance, at upstream and downstream stations, pH, dissolved oxygen and temperature will be monitored once per month year round. Total phosphorus, bacteria and ammonia–nitrogen will be added to both upstream and downstream stations at a frequency of once per month during the summer season.

The facility's monthly discharge monitoring reports are reviewed by permit staff in Ohio EPA's Southwest District Office. Ohio EPA staff will also conduct unannounced facility inspections at least twice annually

until all identified operational and process changes have been completed.

After the Lewisburg operational improvements have been in place for at least one year, Ohio EPA will return to monitor Twin Creek at RM 34.9 by September 2011 to determine if progress toward meeting the Aquatic Life Use is being made. This work would follow Ohio EPA's protocol for sampling the aquatic biology and chemistry. If sufficient progress is not being made, Ohio EPA will evaluate the options available under NPDES authority, including additional operations assistance and enforcement.

Ohio EPA will report progress in its Integrated Report until the impairment has been eliminated.

Commitment to revise pollution controls, as necessary

The SWDO surface water manager will initiate a reexamination of the implementation strategy if significant progress is not being made by the end of the next NPDES permit cycle for Lewisburg.

Ohio EPA will report on the progress of any approved 4B in future 303(d) lists.

L5.2.2.1 First Report on Twin Creek 4B Demonstration (2012 Integrated Report)

Addressing organic solids issues at the Lewisburg WWTP has proven more difficult than originally anticipated. Ohio EPA is continuing to work with the WWTP to address compliance issues.

L5.2.2.2 Second Report on Twin Creek 4B Demonstration (2014 Integrated Report)

A permit to install for WWTP improvements was approved on July 10, 2013. The approved upgrades include a fine spiral screen and continuously backwashed tertiary filters. The Village has been awarded Ohio Public Works Commission funding for completion of the project. The expected date of completion of construction is July 2014. The improvements are expected to reduce the solids being discharged from the treatment plant and therefore the associated organic enrichment, which is expected in turn to result in attainment of the designated aquatic life use.

L5.2.2.3 Third Report on Twin Creek 4B Demonstration (2016 Integrated Report)

The following upgrades have been completed and are on-line:

- A new fine spiral screen;
- Upgrade of the existing circular aeration tanks to a zoned system to support biological nutrient removal (BNR) processes;
- All new mechanical equipment installed in the existing clarifiers;
- Addition of tertiary moving bed sand filters;
- Ultraviolet (UV) disinfection upgrade;
- New generator;
- Sludge pumping upgrades for both the return activated sludge (RAS) and waste activated sludge (WAS); and
- Sludge storage improvements.

Operators are trying to optimize the WWTP operations with small changes such as fine bubble diffusers in the sludge holding tank. There have been challenges trying to meet the 1 mg/L total phosphorus

limit. Ohio EPA's Compliance Assistance Unit (CAU) has assisted with the operations at the plant. Other TMDL requirements were incorporated into the facility's NPDES permit when the permit was modified in April 2015.

L5.2.3 Sycamore Creek (Walnut Creek Watershed)

Problem causing the impairment.

Ohio EPA measured the water quality in the Walnut Creek watershed in 2005, collecting biological, chemical and physical data. Impairment of biological water quality standards (OAC 3745-1-07) was measured at six sites on Sycamore Creek, a tributary to Walnut Creek.

Three sites in Sycamore Creek met the biological criteria and three did not. The most upstream site (river mile (RM) 12.2) was impaired due to organic enrichment (probably due to septic systems), and then two sites (RMs 9.6 and 4.7) met the criteria. The next two sites (RM 4.18 (Hill Road) and 2.6 (Busey Road) partially met the criteria. The stream recovered to fully meet the criteria at the most downstream site (RM 0.2).

The City of Pickerington WWTP discharges to Sycamore Creek at RM 4.35. No impairment to Sycamore Creek immediately upstream of Pickerington or downstream of RM 2.6 was measured. The biological impairment is resulting from the Pickerington WWTP effluent discharge.

The site at RM 4.18 only partially met the WWH biological criteria. The fish community was in very good condition while qualitative invertebrate sampling revealed a low-fair community. This is likely caused by the proximity of the Pickerington WWTP to this sampling station and documented chronic toxicity of effluent to *Ceriodaphnia* (Ohio EPA, 2006, Bioassay Report 06-3447-C). Both fish and invertebrate communities improved at Sycamore Creek sites downstream of RM 4.18.

The chemical water quality criterion for total dissolved solids (1500 mg/L) was exceeded in Sycamore Creek downstream of the Pickerington WWTP (2110, 1950, 1710 mg/L).

Link between the source of the problem and the specific listed impairments

High total dissolved solids (TDS) concentrations result from the Pickerington WWTP discharge. The WWTP accepts a waste stream from the Pickerington water treatment facility which uses a Zeolite process to treat drinking water. This process creates a wastewater high in dissolved solids which the WWTP does not effectively treat. This high dissolved solids waste gets passed through the WWTP and into Sycamore Creek.

Bioassay testing results on the Pickerington effluent and mixing zone have confirmed TDS-related impairment to the invertebrate community as well by demonstrating negative effects (immotility, death) to *Ceriodaphnia*. Mayfly populations found downstream of the WWTP are impaired revealing only 2 mayfly taxa (compared with 8 found upstream of the discharge point) plus a variety of TDS tolerant and facultative invertebrates as well. The two sites upstream and the site at the mouth were in full attainment of WWH biological standards with moderately good (qualitative assessments at RM 9.6 and 4.7) to exceptional (ICI=50 at RM 0.2) communities of invertebrates.

Low fish MIWB scores found at RM 2.6 provide further evidence of a problem with excessive TDS in-

stream contributing to reduced numbers of fish.

Further information regarding the 2005 findings is available in the Biological and Water Quality Study of Walnut Creek and Select Tributaries 2005, available on Ohio EPA web site (http://www.epa.ohio.gov/portals/35/documents/WalnutCreek2005TSD.pdf).

Ohio EPA included total dissolved solids for this assessment unit in the 2008 Integrated Report (303(d) list), available at (http://www.epa.ohio.gov/dsw/tmdl/2008IntReport/2008OhioIntegratedReport.aspx).

Description of pollution controls and how they will achieve water quality standards

The City of Pickerington operates a sewer collection system and a wastewater treatment facility and is regulated under a NPDES permit (4PB00017*LD).

The existing Pickerington wastewater plant has an average daily design flow of 1.6 MGD. Pickerington is expanding its wastewater plant to an average design flow of 3.2 MGD to accommodate new development within its service area. Along with other improvements, for solids handling the City will construct two new aerobic digesters and new sludge drying beds for storage.

The permit requires the development of a method to control discharges of elevated dissolved solids. Both interim and final effluent concentrations of dissolved solids are present in the permit (calculated by wasteload allocation) which should serve to ameliorate the violations of the WQS in Sycamore Creek (see the NPDES permit fact sheet for the Pickerington WWTP: http://wwwapp.epa.ohio.gov/dsw/permits/permit_list.php).

Point and nonpoint source loadings that will achieve water quality standards.

The allowable loading is based on the beneficial uses assigned to the receiving waterbody in OAC 3745-1. Dischargers are allocated pollutant loadings/concentrations based on the Ohio Water Quality Standards (OAC 3745-1). TDS was allocated using the mass-balance method, using the following general equation:

Discharger WLA = [(downstream flow x WQS) - (upstream flow x background concentration)] / discharge flow.

See the permit fact sheet (http://wwwapp.epa.ohio.gov/dsw/permits/permit_list.php) for details.

The continuous discharge from the WWTP into Sycamore Creek at low stream flows during the summer represent the critical condition for the aquatic ecosystem. The WLA calculation accounts for the nonpoint source load in the equation. See the permit fact sheet (http://wwwapp.epa.ohio.gov/dsw/permits/permit_list.php) for details.

All loads in kg/d	Existing WWTP Flow	Expanded WWTP Flow
TMDL	11,022	20,433
LA	666	666
WLA	10,356	19,767

An estimate or projection of the time when WQS will be met
The NPDES permit requires the City of Pickerington to meet the final effluent limitations in the permit within 25 months of the effective date of the permit (in 2010). WQS should be met soon after as macroinvertebrates can recover quickly (6 months to a year) once the stressor is removed.

Schedule for implementing pollution controls

Reference the NPDES permit fact sheet for scheduling information (http://wwwapp.epa.ohio.gov/dsw/permits/permit_list.php).

Monitoring plan to track effectiveness of pollution controls

The City of Pickerington WWTP is required to submit monthly Discharge Monitoring Reports for effluent quality from the WWTP and upstream and downstream of its discharge point.

The permit requires 24-hour composite sampling for TDS of the WWTP effluent, to be completed three times per week year-round. In addition, the WWTP will collect an ambient grab sample for TDS at sites both upstream and downstream of the discharge into Sycamore Creek; they will use a laboratory of their choice.

The facility's monthly discharge monitoring reports are reviewed by permit staff in Ohio EPA's Central District Office. Ohio EPA staff will also conduct unannounced facility inspections until all identified operational and process changes have been completed.

Water chemistry and macroinvertebrate community health will be monitored following the construction and new plant start up. After the Pickerington WWTP improvements have been in place for at least one year, Ohio EPA will return to monitor Sycamore Creek to determine if progress toward meeting the Aquatic Life Use is being made. This work would follow Ohio EPA's protocol for sampling the aquatic biology and chemistry. If sufficient progress is not being made, Ohio EPA will evaluate the options available under NPDES authority, including operations assistance and enforcement.

Ohio EPA will report progress in its Integrated Report until the impairment has been eliminated.

Future monitoring

City of Pickerington (far field monitoring for TDS in the NPDES permit, analysis by a laboratory of their choice) and Ohio EPA DSW, CDO WQ (chemistry, with analysis by Ohio EPA DES) and EAS (macroinvertebrates).

Cost estimates

Five work days for two people to sample chemistry, 1 work day for two people to do qualitative macroinvertebrate monitoring, and the associated standard lab costs for TDS samples.

Analysis of the results and annual reporting

Ohio EPA, CDO, DSW WQ staff will examine both data from Ohio EPA sampling and that generated by Pickerington. EAS macroinvertebrate staff will analyze their own data. Ohio EPA CDO staff will complete

the reporting necessary for this 4B demonstration.

Revising the implementation strategy and corresponding pollution controls

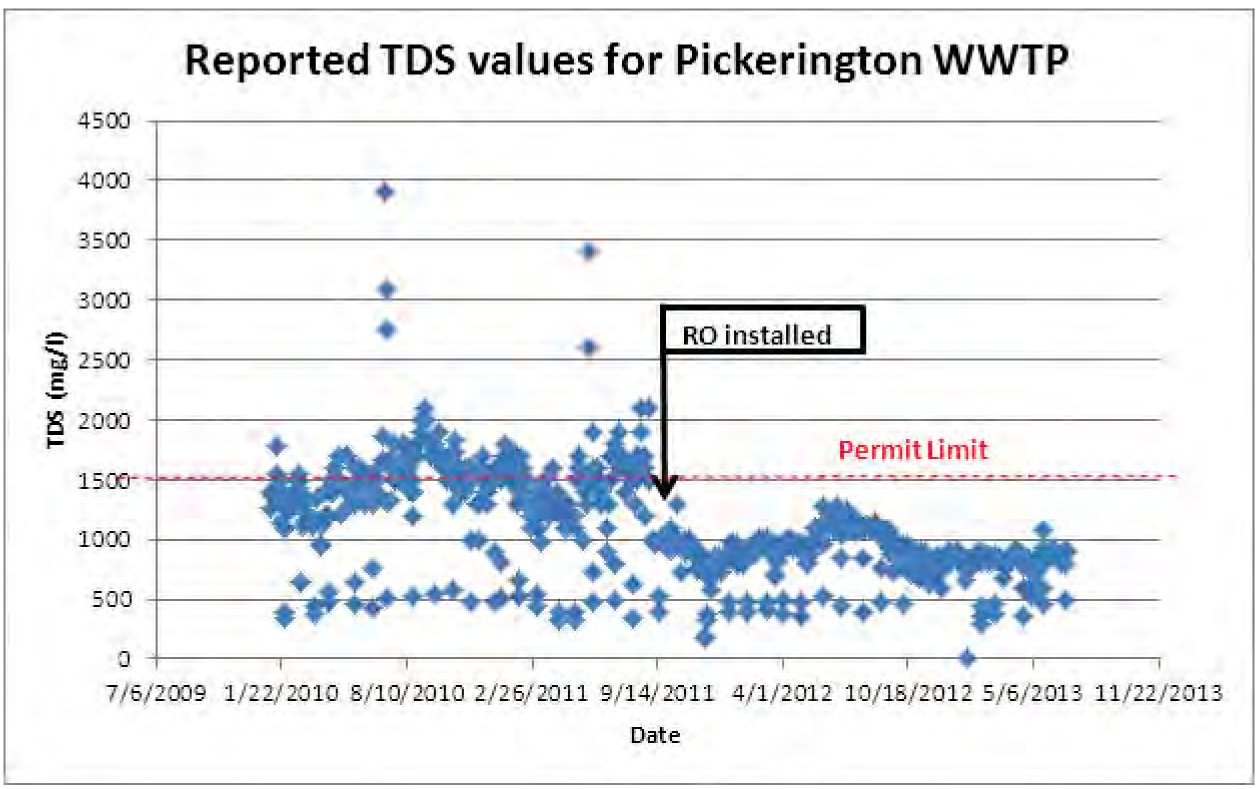
The CDO surface water manager will initiate a reexamination of the implementation strategy if significant progress is not being made by the end of the next NPDES permit cycle for Pickerington.

L6.2.3.1 First Report on Sycamore Creek 4B Demonstration (2012 Integrated Report)

The City of Pickerington replaced their ion exchange water treatment plant with a reverse osmosis water treatment plant in order to address the NPDES TDS effluent limit violations at their WWTP. Very soon after the new plant began operating, Pickerington returned to compliance with the NPDES permit conditions implementing the water quality criterion for TDS. Ohio EPA expects this to eliminate any impairment in Sycamore Creek.

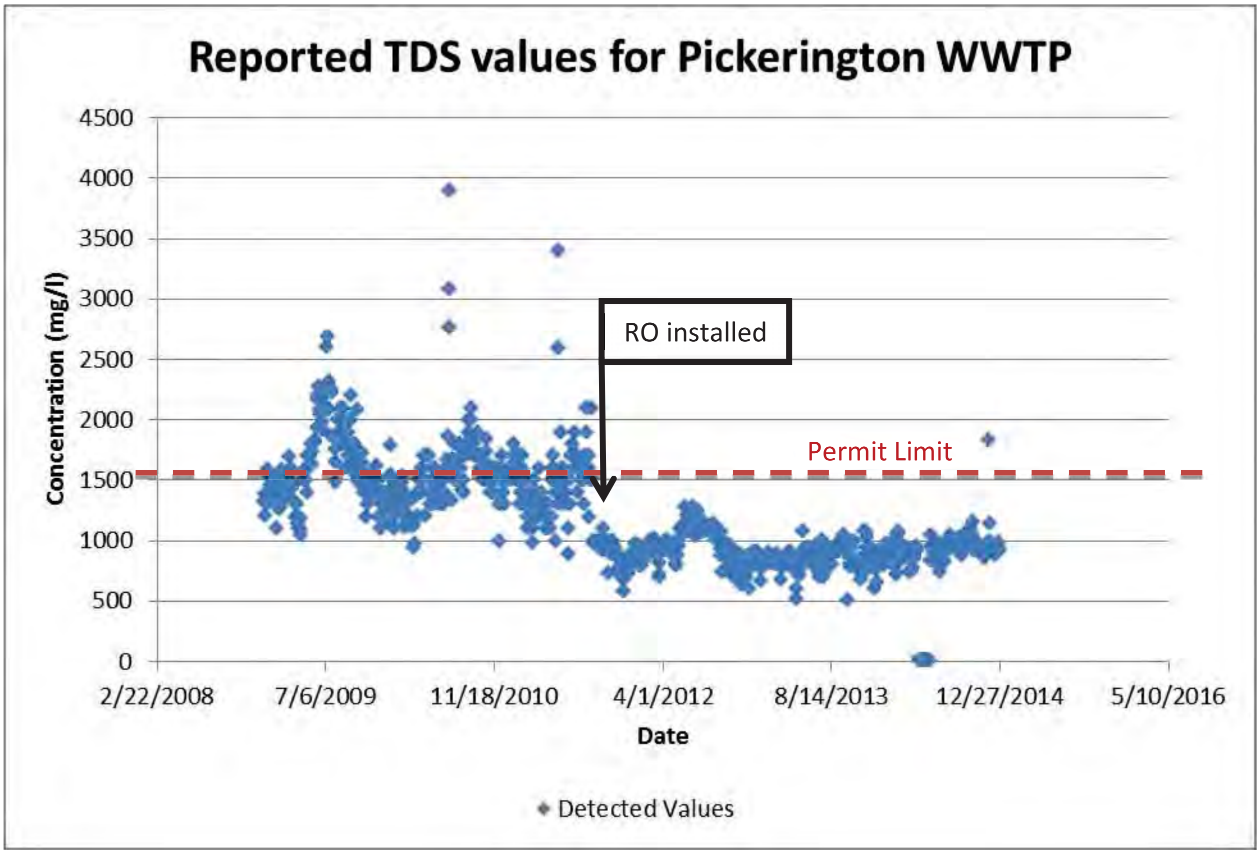
L6.2.3.2 Second Report on Sycamore Creek 4B Demonstration (2014 Integrated Report)

Sycamore Creek has not been reevaluated for aquatic life use support since the 2012 Integrated Report. However, the facility has not reported any TDS violations since the reverse osmosis system was put in place (see figure below).



L5.2.3.3 Third Report on Sycamore Creek 4B Demonstration (2016 Integrated Report)

Sycamore Creek has not been reevaluated for aquatic life use support since the 2012 Integrated Report. However, the facility has not reported any TDS violations since the reverse osmosis (RO) system was put in place (see figure below). Pickerington's permit limit for TDS is 1,628 mg/L. On November 24, 2014, an exceedance of the permit limit for TDS was detected; however, the limit is based on a monthly average, which for November was approximately 1022 mg/L, well below the established limit. Therefore, compliance with the permit was maintained.



L5.3 Projects included in the 2014 Integrated Report

After completion of the 2012 Integrated Report and before completion of the 2016 Integrated Report, Ohio submitted one 4B alternative as part of an approved TMDL: Great Miami River (upper) watershed TMDL Report. Together with TMDLs approved for other impairments to the aquatic life use, the 4B work should bring the river into attainment with water quality standards.

L5.3.1 Great Miami River (Great Miami River (upper) Watershed)

During the 2008 field survey, Ohio EPA identified that the Great Miami River at river mile 158.15 was partially supporting its warmwater habitat aquatic life use. Identified causes of impairment included habitat alteration, siltation, flow alteration, and organic enrichment/dissolved oxygen (DO). Ohio EPA proposes that the organic enrichment/DO cause of impairment be handled through a category 4B alternative instead of a total maximum daily load (TMDL). Further details are discussed below.

Additional information is available in the main text of the TMDL report and in the biological and water quality study publication (http://www.epa.ohio.gov/portals/35/documents/Upper_GMR_TSD_2008.pdf).

Identification of segment and statement of problem causing the impairment
The Great Miami River upstream of the WWTP is in partial attainment of its aquatic life use because of habitat alteration, siltation, flow alteration, and organic enrichment/DO. Organic enrichment/DO is partially attributed to an upstream WWTP at RM 158.15 – Indian Lake/Logan County (OH0036641). Other sources include Indian Lake overflow of warm water in summer months and sediment from Cherokee Mans Run. Downstream of the WWTP, the river is sluggish from the effects of the low head dam impoundment in Quincy. This sluggish water is not allowing effective re-aeration of river water, which exacerbates the dissolved oxygen (DO) stresses caused by nutrient enrichment and sewage solids from the Logan County Indian Lake WWTP. The result is partial attainment downstream at Notestine Road (RM 153.45). Proper treatment of wastewater will help to alleviate the impacts to this stressed section of the Great Miami River.

The Logan County Indian Lake Sanitary Sewer District has an Infiltration and Inflow (I&I) problem in the collection system. Hydraulic surges during storm events overwhelm the collection and treatment systems causing a secondary treatment bypass. The result is the discharge of undertreated sewage with ammonia and solids entering the Great Miami River at RM 158.15, contributing to partial attainment due to low macroinvertebrate performance at Notestine Road (RM 153.45).

Description of pollution controls and how they will achieve water quality standards
On March 6, 2009 the Logan County Board of Commissioners was issued a NPDES permit number 1PK00002*KD for the discharge of treated waste water to the Great Miami River. This permit includes a compliance schedule for the elimination of a secondary treatment system bypass. This bypass allows for the discharge of primary treated waste water to go directly to the Great Miami River. The bypass contributes to additional organic and nutrient loadings to the river. The permit compliance schedule address both phase 1 and phase 2 projects designed to eliminate secondary treatment system bypasses at the plant. The phase 1 projects also will address several collection system overflows. The schedule requires completion of phase 1 projects by no later than July 1, 2011. The phase 2 projects are scheduled for completion by no later than July 1, 2016. On June 26, 2007 Permit to Install (PTI) 597728 was issued to the Logan County Water Pollution Control District. This PTI includes the following upgrades: a new 24” force main and lift station in the slough area; new influent fine screens; a new equalization tank (1.55 million gallons); conversion of existing primary clarifiers to equalization (0.5 million gallons); a new UV disinfection system; conversion of the anaerobic digesters to aerobic digester; and the addition of a new belt press and septage receiving station. The majority of the phase 1 projects were competed in early 2010. With the completion of this work the number of bypasses and collection system overflows has been reduced significantly. This will result in a reduction of loadings to the Great Miami River. With the completion of the phase 2 upgrades, all discharges from the plant will need to meet the water quality standards. This should eliminate any water quality impacts downstream resulting from treatment plant discharges.

Aquatic life use was assessed during the summer of 2008 while the WWTP facility was undergoing construction improvements (entitled Phase I). To address one of the causes of impairment, discharge monitoring report (DMR) data and a violations history from this facility were explored for any recognizable changes in performance before and after completion of Phase I. Other causes and sources of impairment (i.e., siltation, habitat alteration) are addressed in the TMDL project report under loading development.

Phase I construction was completed in late December 2009. The quantitative analysis contained herein contrasts the Indian Lake WWTP performance prior to (January 2005 to December 2009) and following (January 2010 to May 2011) completion of Phase I construction. To summarize, the comparison shows the following changes:

1) Reduction in nutrient concentrations for final outfall (station 001) based on review of total phosphorus, ammonia, and nitrite/nitrate effluent data;
2) Increase in influent (station 601) concentration of carbonaceous BOD (CBOD) and total suspended solids (TSS);
3) Decrease in TSS spikes from final outfall (station 001);
4) Reduction in number of bypass occurrences around secondary treatment (station 602); and
5) Reduction in number of limit violations (TSS, ammonia, and pH) for final outfall (station 001).

While the improvements in effluent quality and WWTP operations are clearly manifest in 2010, they are somewhat confounded in 2011 due to anomalous meteorological and hydrological conditions within February through May. The upper GMR basin received considerable rainfall and experienced correspondingly high stream flow during late winter to mid spring 2011. Figure E-1 shows a frequency distribution of flow magnitude by percent exceedance for the GMR at Sidney OH for a record of over 25 years of daily flow. This gage is located 28 miles (river miles) downstream of the WWTP outfall. Flows during this period were consistently in the high percentile of non-exceedance. Flow produced from these rain events were exceeded 15 percent or lower over time (or *not* exceeded 85 percent or higher over time). Hence, some of unexpected results (discussed below by topic) following completion of Phase I construction can be explained by these anomalous high flows experienced within the WWTP collection area.

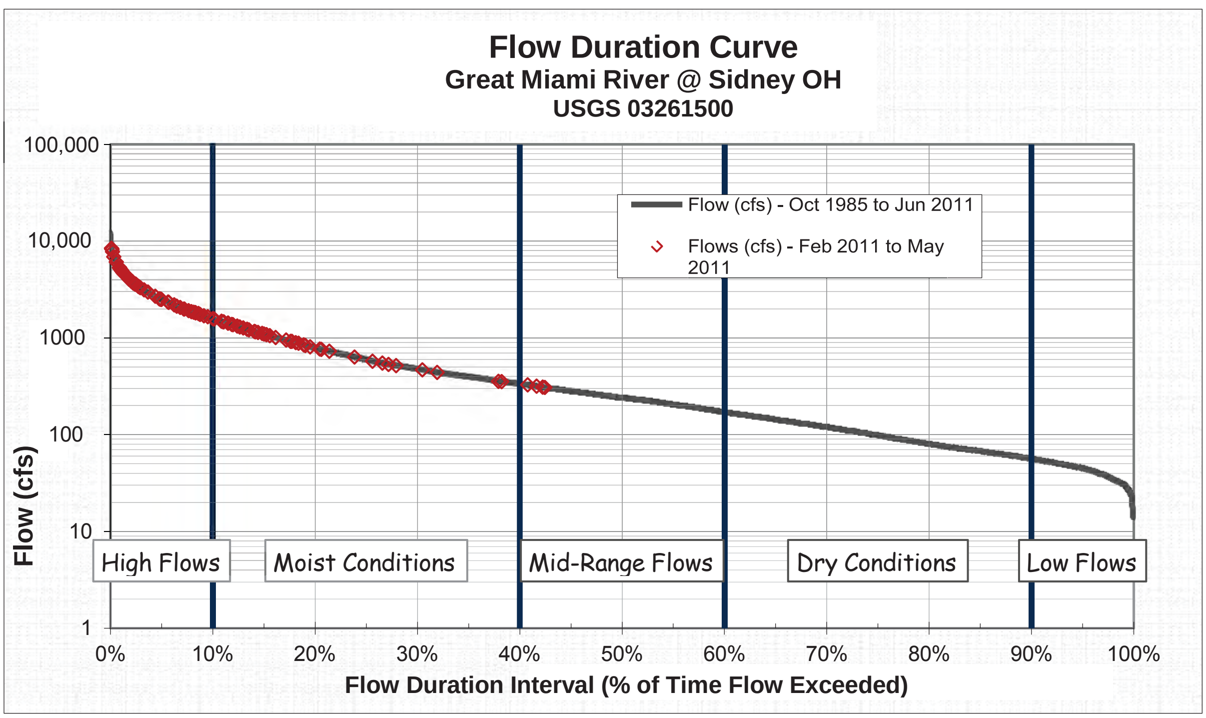


Figure E-1. Flow duration curve for data collected at USGS automatic gauge 03261500 (Great Miami River at Sidney OH) for the period October 1985 through June 2011. Flows during 2011 that occurred between February 16 and May 31 are highlighted in red. All values reported as average daily flow in cubic feet per second (cfs).

Nutrient Loading (Station 001)

When examining loadings for total phosphorus and ammonia from the final outfall, there is a progressive decline from 2005 to 2010 for both summer season (Figure E-2) and annual (Figure E-3) compilations. However, mean daily loadings increased in 2011 (annual compilation) for total phosphorus but not for ammonia (Figure E-3). For nitrite and nitrate effluent loadings, there was no consistent decline in magnitude; though for the 2009 and 2010 summer season, magnitudes were considerably lower than in the previous four years (2005-2008) (Figure E-2). This decline was also apparent for annual nitrite and nitrate loadings – 2009 to 2011 was noticeably lower than in the 2005-2008 period (Figure E-3).

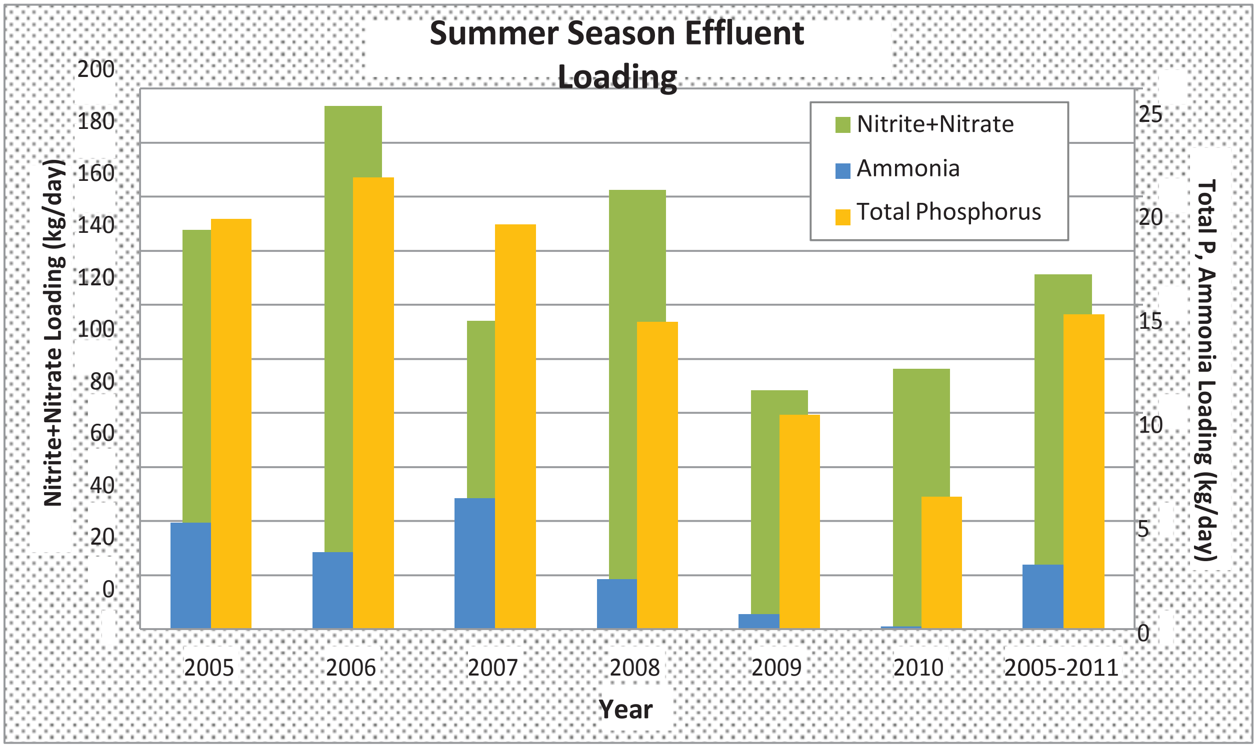


Figure E-2. Mean loading (in kg/day) of total phosphorus, ammonia, and nitrite+nitrate by year for summer season (June to September) observations for Station 001 (final outfall) of Indian Lake WWTP. The overall seven- year summer season mean loading is also shown.

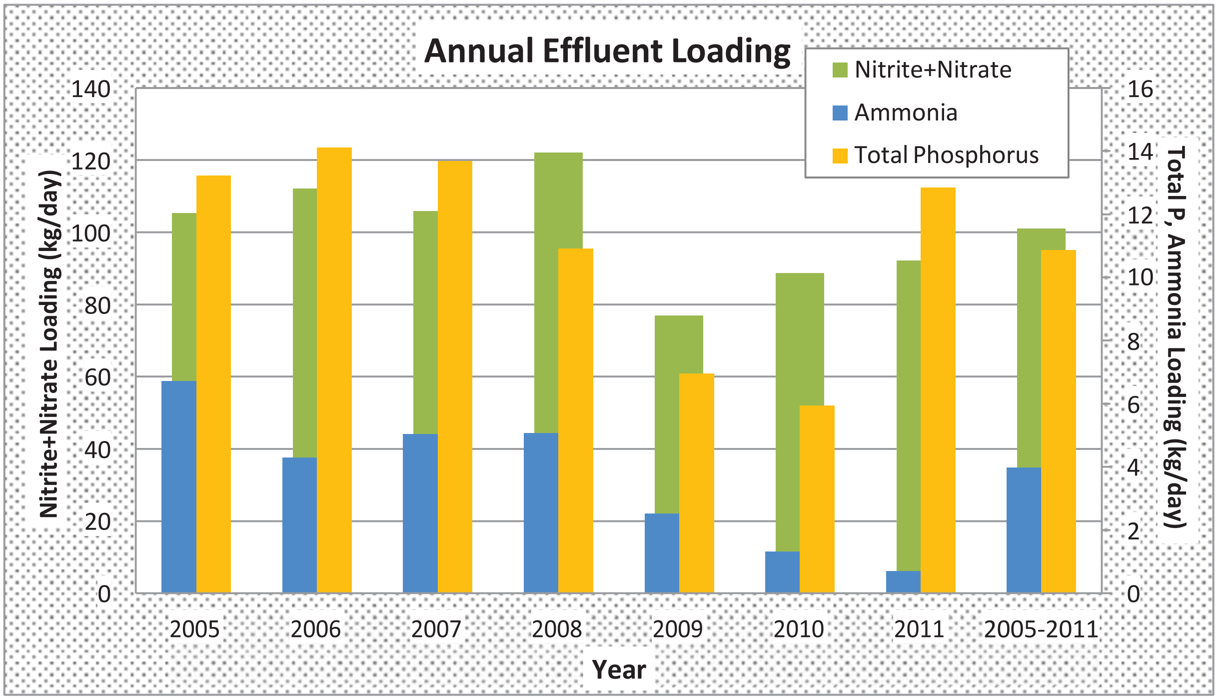


Figure E-3. Mean loading (in kg/day) of total phosphorus, ammonia, and nitrite+nitrate by year for annual (January to December) observations for Station 001 (final outfall) of Indian Lake WWTP. The overall seven-year annual mean loading is also shown.

Influent Concentration (Station 601)

Concentrations of 5-day carbonaceous BOD (CBOD5) and total suspended solids (TSS) were examined for the influent station (station 601) to Indian Lake WWTP. Figures E-4 (summer) and E-5 (annual) are included to show mean concentrations by year and overall for both CBOD5 and TSS. The overall (2005-2011) mean concentration is shown as a seven-year "normal". Concentrations of influent TSS increased markedly in 2009, and subsequently in 2010 and 2011, to reflect improved changes in septage receiving (from HSTS). A reconfigured influent screening system changed the location of influent monitoring to now measure 100 percent of incoming septage.

The increased concentration seen in 2010 (summer and annual) and 2011 (annual only) compared to the 2005-2008 period can further be explained by completion of Phase I improvements on the wastewater *collection system*. The resultant increase in concentration for both of these parameters suggests improved capture of waste from the collection system – there is less dilution flow from infiltration and inflow problems and reduced storm water overflow from a slough area into the wastewater stream. The increasing multi-year trend in influent concentration for both TSS and CBOD5 are further supported by Figures E-6 and E-7, respectively, which show a time series with a 60-day running average and a large gain in the spring of 2009.

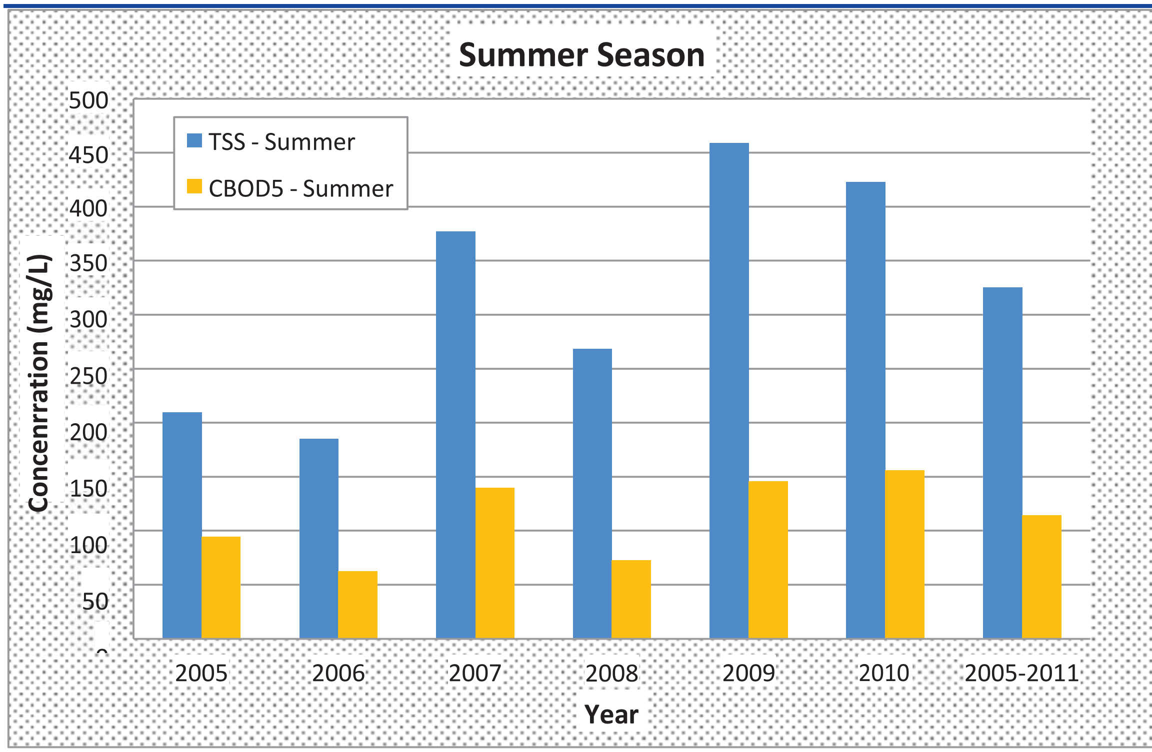


Figure E-4. Mean concentration (in mg/L) of CBOD 5-day and TSS by year for summer season (June to September) observations for Station 601 (influent) of Indian Lake WWTP. The overall seven-year summer season mean concentration is also shown.

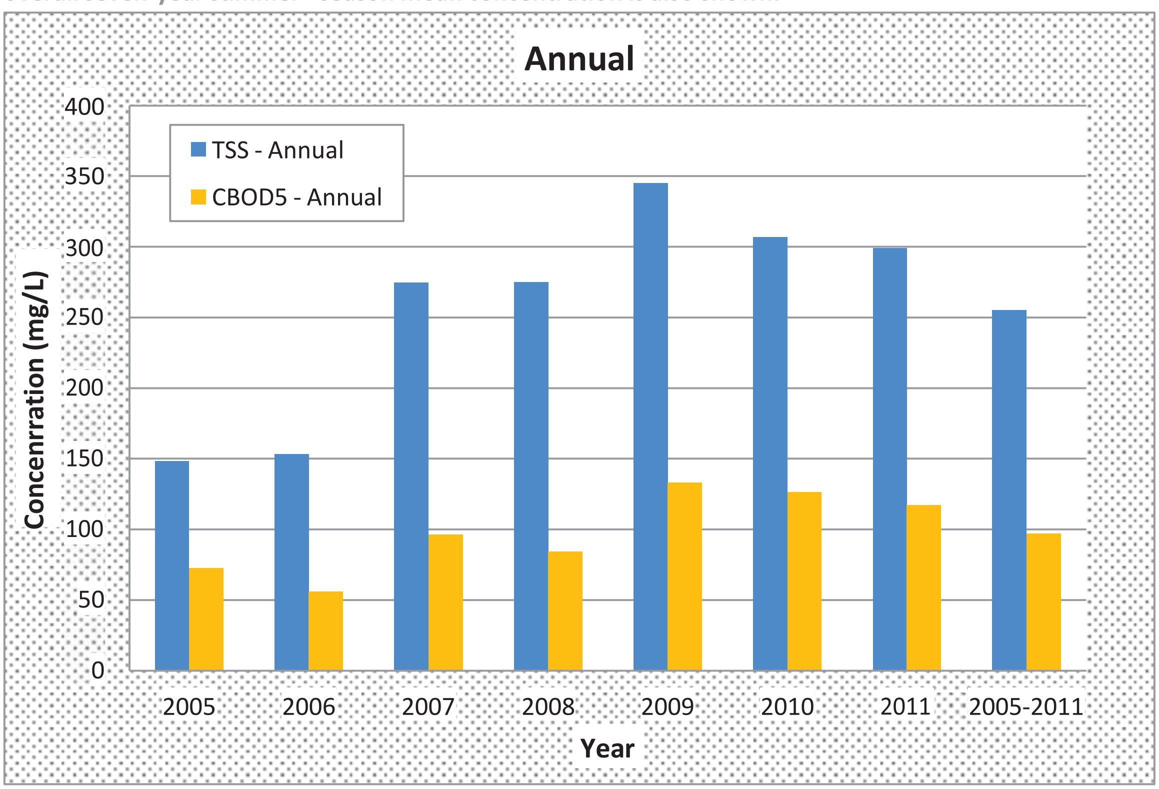


Figure E-5. Mean concentration (in mg/L) of CBOD 5-day and TSS by year for annual (January to December) observations for Station 601 (influent) of Indian Lake WWTP. The overall seven-year annual mean concentration is also shown.

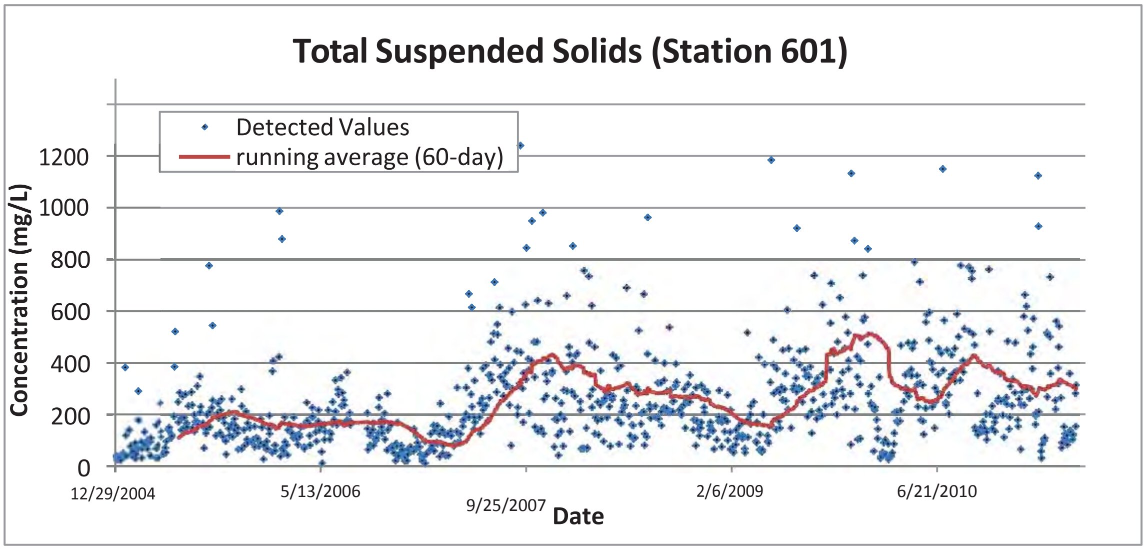


Figure E-6. Time series of TSS from January 2005 to May 2011 for station 601 for Indian Lake WWTP. A 60-day running average was also computed and overlaid (solid red line) on the individual observations.

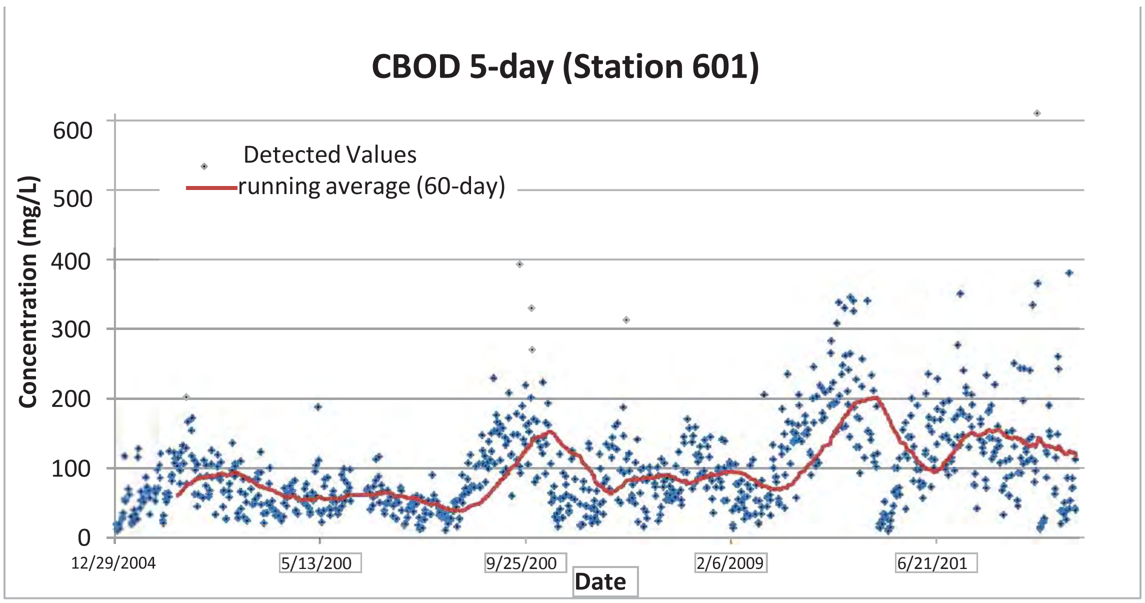


Figure E-7. Time series of CBOD5 from January 2005 to May 2011 for station 601 for Indian Lake WWTP. A 60- day running average was also computed and overlaid (solid red line) on the individual observations.

<u>Total Suspended Solids – Peak Events (Station 001)</u>

A peak event is a high loading event and is defined here as a daily TSS load that exceeds 500 kg/day. The TSS permit limit for station 001 for this facility is 522 kg/day (weekly or average criterion). There were 34 of these events between 2005 and 2009 (Figure E-8). Performance following Phase I completion showed no high loading events for all 2010, and for those that occurred in 2011 – 6 of 7 events occurred in early March 2011.

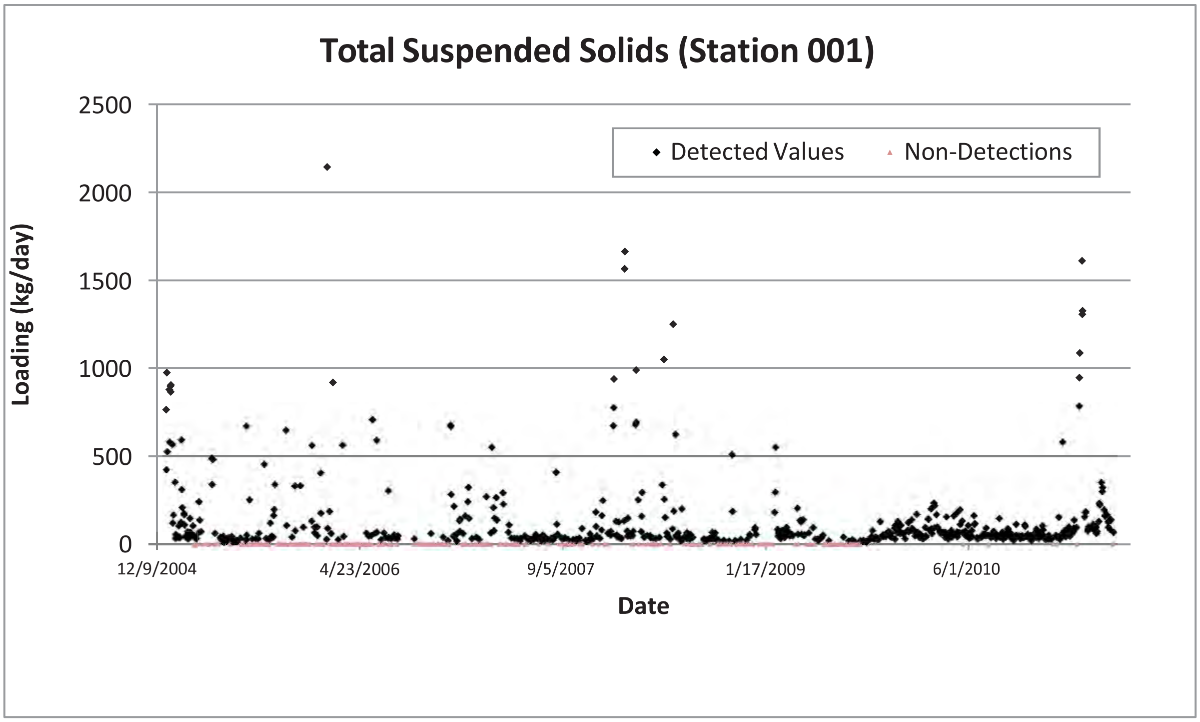


Figure E-8. Time series of daily total suspended solid loads (kg/day) for Indian Lake WWTP for station 001 for the period January 2005 to May 2011.

Bypass Occurrence (Station 602)

Indian Lake WWTP bypass information such as number of occurrences per year and total and average volume of flow per year was examined and showed a marked decrease once Phase I was completed (Table E-1). A bypass event avoids secondary wastewater treatment and poses potentially significant harm to the receiving water. However, once into 2011 the number of bypass occurrences increased to 11 but all 11 events occurred after 2/17/2011 when the GMR basin, and corresponding WWTP collection area, experienced high percentile flood flows (Figure E-1). DMR data was only available to 5/27/2011 which is still within this identified high flow period. The sharp increase in 2011 also reflects the treatment plant's elimination of several bypasses *within the collection system*. Thus all of the flow that enters the system now makes it completely to the plant. The new expanded equalization system at the WWTP, as part of Phase I construction, will help capture more material before it is bypassed *at the plant*.

Table E-1. Summary of bypass information for Indian Lake WWTP (station 602) for the period 8/1/2006 to 5/26/2011.

Year	Number of Occurrences	Total Volume (MG)	Avg Volume per Occurrence (MG)
2006	9	22.4	2.49
2007	20	72.8	3.64
2008	22	84.8	3.85
2009	22	29.7	1.35
2010	6	12.1	2.02
2011 (5 months)	11	179.6	16.3

Limit Violations (Station 001)

A review of violations of permit limits for Indian Lake WWTP was made and is summarized in Table E-2 below. Both concentration and loading limit violations were considered and for both average (monthly) and maximum (weekly) statistical periods. While found in the review, violations for total chlorine residual were omitted because of insignificance to the impairment cause (DO/organic enrichment). Since completion of Phase I, there was a considerable reduction in number of violations (Table E-2). The four TSS violation events that occurred after Phase I completion all occurred in early March 2011.

Table E-2. Summary of limit violations for Indian Lake WWTP (station 001) for the period January 2005 to May 2011. Violations for total chlorine residual are omitted.

	Number of Limit Violations	
Parameter (code)	2005 - 2009	2010 - May 2011
TSS (00530)	8	4
pH (61942)	1	0
ammonia (00610)	7	0

Conclusion

The partial impairment of aquatic-life use that exists at RM 153.45 (Notestine Rd) of the GMR (12-digit HUC 05080001-03-02) is caused by multiple stressors and sources. While the predominant stresses are habitat alteration and siltation – a low gradient river system choked by sediment, a secondary stress is organic enrichment and low DO produced by an upstream POTW. The Agency aquatic-life use assessment was conducted and completed in 2008 but the POTW was in the midst of constructing improvements to minimize their bypass (of secondary treatment) occurrence and volume. The first phase (Phase I) of construction was completed in late December 2009. The above analysis described effluent quality and behavior by comparing results prior to and following this completion date. Though WWTP performance was confounded by high flows in early 2011 (February through May), 2010 performance was considerably better than that observed in the prior four years (2005-2008). Phase II construction will begin soon and address treatment levels needed to meet permit and water quality standards. The goal is that completion of Phase I and Phase II construction will, with high likelihood, remove the stressor of impairment associated with organic enrichment and low dissolved oxygen.

An estimate or projection of the time when WQS will be met

The June 2011 NPDES permit Part I,C-Schedule of Compliance paragraph f, gives April 1, 2017 as the date the Indian Lake Water Pollution Control Facility wastewater works will attain final compliance. Re-evaluation of biological water quality standards shall begin no earlier than the field season of 2018.

Schedule for implementing pollution controls

On July 13, 2011, the Logan County Board of Commissioners were issued NPDES number 1PK00002*LD. This permit contains a compliance schedule for completion of phase 2 projects that will address secondary treatment system bypassing at the plant. The permit schedule includes the following compliance dates:

1. Submit an approvable “No Feasible Alternatives Analysis by no later than October 1, 2012.
2. Submit a general plan for upgrades design to eliminate the secondary bypass by no later than April 1, 2013.

3. Submit a Permit to Install for treatment system upgrades by no later than April 1, 2014.
4. Complete treatment system upgrades by no later than July 1, 2016.
5. Attain final compliance with NPDES permit limits and conditions by no later than April 1, 2017.

With the completion of the phase 2 projects, the Logan County Water Pollution Control District Indian Lake plant should be in compliance with their NPDES permit conditions, thus eliminating any effluent- derived water quality impacts downstream.

Monitoring plan to track effectiveness of pollution controls

As part of their NPDES permit, Indian Lake Water Pollution Control Facility wastewater works measures and reports plant bypasses at station 602 on a monthly basis. In addition, outfall 001 will report TSS, $cBOD_5$, phosphorus, ammonia and nitrate/nitrite discharges to the Great Miami River on a monthly basis. Sampling is done three times a week for TSS, $cBOD_5$, and NH_3. Phosphorus and NO_2/NO_3 will be sampled once a week. SSO discharges will be reported within 24 hours of the occurrence. The facility's monthly discharge monitoring reports are reviewed by permit staff in Ohio EPA's Southwest District Office. Inspection of the facility will be done every two years starting in 2012.

No earlier than the field season of 2018, Ohio EPA will sample the impaired section of Great Miami River (RM 153.45, Notestine Rd.) for chemistry, fish and macroinvertebrates. The chemistry will be sampled at one location and five sampling events will be completed. The fish will be sampled at one location with two passes each. The macroinvertebrates will be evaluated on one sampling event. This work will follow Ohio EPA's protocol for sampling the aquatic biology and chemistry. The sampling will take place during the summer/fall sampling season with analysis by Ohio EPA's laboratory and reporting to Southwest District Office.

Commitment to revise pollution controls, as necessary

The SWDO surface water manager will initiate a reexamination of the implementation strategy if significant progress is not being made by the end of the next NPDES permit cycle for Indian Lake.

Ohio EPA will report on the progress of any approved 4B in future 303(d) lists.

L5.3.1.1 First Report on Great Miami River 4B Demonstration (2014 Integrated Report)

The facility completed a Phase One study / upgrade ($ 10,000,000) in 2011. Phase One projects included new influent screens, two MGD in equalization, a new express force main and lift station, and upgrades to the solids handling systems (belt press and septage receiving). The sewer district reported seven SSOs and several secondary bypasses in 2013.

In addition, the sewer district has hired two consultants to work on aspects of the project. The district has begun a Capacity Management Operations and Maintenance program to oversee the collection system. New sewer use regulations have been implemented. In 2012 the district installed rain gauges and 18 flow meters. A model of the sewer is being developed. As part of the phase 2 work, the district is looking at treatment plant alternatives, maximizing existing treatment systems, and high rate treatment. The district is on schedule to meet the next deadline.

L5.3.1.2 Second Report on Great Miami River 4B Demonstration (2016 Integrated Report)

The Indian Lake Water Pollution Control District operates a 4.6 MGD WWTP that discharges directly to the Great Miami River. The plant serves the surrounding lake community as well as the communities of Lakeview, Russells Point, Belle Center and Huntsville. Excessive infiltration and inflow into the collection system has contributed to collection system bypasses and blending at the plant (blended flows are screened and disinfected before recombining with the final effluent).

In response the district performed a No Feasible Alternatives Analysis (2006) of both the collection and treatment systems. An adaptive management approach was selected. A two phase schedule was developed. Phase I work was completed in 2010. This phase included upgrades to the influent pump station; construction of new equalization basins (1.5 million gallons); installation of UV disinfection; updates to the bio solids dewatering equipment; and construction of a new pump station and force main was added to the Slough area.

As part of the Phase II work, the district is working on expansion of peak secondary and disinfection treatment capacities (peak 6.0 MGD plus). A PTI application for UV system upgrades was submitted in September, 2014. The district is upgrading the final clarifier weirs, baffles and mechanisms to allow for treatment of peak flows. With the completion of this work the amount of flow that receives complete secondary treatment will be significantly increased.

The schedule for implementation of the No Feasible Alternatives Analysis Phase II projects has been inserted in the district's NPDES permit. As part of an adaptive approach the district is evaluating the effectiveness of infiltration removal verses additional treatment. The district believes if infiltration and inflow into the system can be reduced by 30 percent, elimination of all wet weather overflows and bypasses will occur. The NPDES permit schedule includes the following dates:

- Study (model) and complete enough infiltration and inflow projects to get to a 10 percent infiltration and inflow reduction. (September 1, 2021)
- Study (model) and complete enough infiltration and inflow projects to get to a 20 percent infiltration and inflow reduction. (September 1, 2027)
- Study (model) and complete enough infiltration and inflow projects to get to a 30 percent infiltration and inflow reduction. (September 1, 2032)

With the completion of the various projects the impacts to the receiving stream should be diminished. Through the adaptive approach the district will be able to evaluate and prioritize projects that will provide the biggest improvements in the shortest time.

Section

M

An Overview of Ground Water Quality in Ohio

M1. Introduction

Section M summarizes water quality assessment data for Ohio's major aquifers based on information requested in the 2006 Integrated Reports Guidance and the 1997 Guidelines for Preparation of the Comprehensive State Water Quality Assessments.

Ground water protection programs for Ohio are briefly summarized in Section M2 as required by section 106(e) of the Clean Water Act. Programs to monitor, evaluate and protect ground water resources are implemented by various state, federal and local agencies. Ohio EPA is the designated agency for monitoring and evaluating ground water quality and assessing ground water contamination problems. Within Ohio EPA, the Division of Drinking and Ground Waters (DDAGW) carries out these functions and coordinates various ground water monitoring efforts within the agency and with other state programs. Short program descriptions are provided with links to program-based web pages to provide the most current information.

Ohio's three major aquifer types are described briefly in Section M3. More detailed descriptions of the major aquifers and water quality of the aquifers are provided in Appendix A. Where possible, the water quality data are associated with major aquifer types. The aquifer descriptions allow the reader to associate water quality with geologic settings.

Sections M4 and M5 summarize sites with verified ground water contamination and identify the major nonpoint sources of ground water contamination in Ohio. These data were obtained from various sources including:

- Potential contaminant sources inventoried as part of Ohio EPA – DDAGW's Source Water Assessment and Protection (SWAP) program;
- Ground Water Impacts Database (maintained by Ohio EPA – DDAGW);
- Underground injection control sites identified in Ohio EPA – DDAGW and Ohio Department of Natural Resources (ODNR) – Division of Oil and Gas Resource Management databases;
- Leaking and formerly leaking underground storage tanks from Ohio Department of Commerce – Division of Fire Marshal's Bureau of Underground Storage Tank Regulations (BUSTR) databases; and
- Federal databases listing Department of Development/Department of Energy (DOD/DOE) facilities and National Priorities List/Comprehensive Environmental Response, Compensation and Liability Act (NPL/CERCLA) sites.

In many instances, these data are not associated with the geologic setting of the impacted aquifer, so statewide summaries are provided.

Section M6 summarizes ground water quality impairments by parameter within Ohio's major aquifers. Two primary data sets are used in this analysis: the drinking water compliance data for public water systems; and the Ambient Ground Water Quality Monitoring Program (AGWQMP) data. The public water system compliance data represents treated (post-processing) water distributed to the public. AGWQMP is an Ohio EPA - DDAGW program created to monitor "raw" (untreated) ground water. The goal is to collect, maintain and analyze raw ground water quality data to measure long-term changes in the water quality of major

aquifer systems. Since Ohio does not have statewide ground water quality standards, comparisons to primary maximum contaminant levels (MCL) or secondary maximum contaminant levels (SMCL) for drinking water were used.

Section M7 briefly discusses ground water-surface water interaction (GW-SW) and a few special studies that provide insight on the interaction, which lead to suggestions for future ground water monitoring efforts. Section M8 presents conclusions and recommendations for future direction concerning statewide ground water monitoring and protection of Ohio's major aquifers.

M2. Ohio's Ground Water Programs

State Coordinating Committee on Ground Water - The State Coordinating Committee on Ground Water (SCCGW) was created in 1992 by the directors of the state agencies that have ground water program responsibilities. The purpose is to promote and guide the implementation of coordinated, comprehensive and effective ground water protection and management programs for Ohio. The SCCGW is composed of ground water technical or management staff from seven state agencies, two federal agencies and The Ohio State University Extension office. Information about the SCCGW bi-monthly meetings and meeting summaries are available on the SCCGW Web site: http://epa.ohio.gov/ddagw/SCCGW.aspx

Ohio Ground Water Protection Programs - Programs to monitor, evaluate and protect ground water resources in Ohio are administered by federal, state and local agencies. Ohio EPA is the designated state ground water quality management agency. The ODNR - Division of Water Resources is responsible for evaluation of the quantity of ground water resources. Ground water-related activities at the state level are also conducted by the Ohio Departments of Agriculture, Commerce (Division of State Fire Marshal), Health and Transportation. The United States Geological Survey (USGS), Ohio Water Science Center, contributes to these efforts with water resource research. Table M-1 (based on Table 5-2, U.S. EPA 305(b) Guidelines, 1997) summarizes agencies responsible for administering the various ground water programs in Ohio.

Table M-1. Summary of Ohio's ground water protection programs.

Programs or Activities	State Activity	Implementation Status*	Responsible Agency
Active SARA Title III Program	✓	E	Ohio EPA – DERR or DMWM
Ambient ground water monitoring system	✓	E	Ohio EPA – DDAGW
Aquifer vulnerability assessment	✓	CE	ODNR – DWR Ohio EPA – DDAGW
Aquifer mapping	✓	CE	ODNR – DWR Ohio EPA – DDAGW
Aquifer characterization	✓	CE	ODNR – DWR
Comprehensive data management system	✓	UR [a]	OWRC
Consolidated Cleanup Standards	NA		
Ground water Best Management Practices	✓	E	ODNR; ODA
Ground water legislation	✓	UR [b]	All Agencies

Programs or Activities	State Activity	Implementation Status*	Responsible Agency
Ground water classification	✓	E [c]	Ohio EPA; ODNR
Ground water quality standards (program specific)	✓	E [d]	Ohio EPA
Interagency coordination for ground water protection initiatives	✓	E	OWRC; SCCGW
Nonpoint source controls	✓	CE	ODA; Ohio EPA; ODNR
Pesticide State Management Plan	✓	E [e]	ODA
Pollution Prevention Program	✓	E	Ohio EPA – DEFA (OCAPP)
Resource Conservation and Recovery Act (RCRA) Primacy	✓	E	Ohio EPA – DERR
Source Water Assessment Program	✓	E	Ohio EPA – DDAGW
State Property Clean-up Programs	✓	E	Ohio EPA – DERR
Susceptibility assessment for drinking water/wellhead protection	✓	E	Ohio EPA – DDAGW
State septic system regulations	✓	E [f]	ODH; Ohio EPA
Underground storage tank installation requirements	✓	E	SFM/BUSTR
Underground Storage Tank Remediation Fund	✓	E [g]	SFM/BUSTR
Underground Storage Tank Permit Program	✓	E	SFM/BUSTR
Underground Injection Control Program	✓	E [h]	Ohio EPA – DDAGW ODNR – DMR
Well abandonment regulations	✓	E [i]	ODNR; Ohio EPA – DDAGW; ODH
Wellhead Protection Program (EPA-approved)	✓	E [j]	Ohio EPA – DDAGW
Well installation regulations	✓	E [k]	Ohio EPA; ODH

*** Table Notes:** **E** – Established; **CE** – Continuing Effort; **UD** – Under Development; **UR** – Under Revision

[a] Data management occurring on an agency/division level; Improvements in search engines make development of multi-agency databases a low priority.

[b] Rules are required to be reviewed every 5 years by state statute.

[c] Established through program-specific classifications.

[d] Standards are program-specific.

[e] ODA received cooperative commitment from other Ohio agencies for the Generic Pesticide Management Plan. The requirement for Specific Pesticide Management Plan was dropped.

[f] The updated Household Sewage Treatment Systems Rules became effective on January 1, 2015 (Ohio Revised Code (ORC) Chapter 3718 and Ohio Administrative Code Chapter 3701-29). Larger systems are regulated by Ohio EPA under separate regulations.

[g] Remediation funds are available from the Petroleum Underground Storage Tank Release Compensation Fund

[h] Ohio EPA regulates Class I and V injection wells; ODNR regulates Class II and III injection wells.

[i] Revised guidance for sealing wells was completed March 2015 by SCCGW workgroup: Regulations and Technical

Guidance for Sealing Unused Water Wells and Boreholes[j] Wellhead Protection Program has evolved to the Source Water Protection Program.

[K] Technical Guidance for Well Construction and Ground Water Protection prepared by SCCGW (2000). Private Water System rules (OAC 3701-28) were last updated in 2011. Revised Water Well Standards (OAC 3745-7) for public water systems are out for comment.

Program Web Sites:

ODA - Ohio Department of Agriculture

Pesticide and Fertilizer Regulation Program http://www.agri.ohio.gov/apps/odaprs/pestfert-prs-index.aspx

Livestock Environmental Permitting Program http://www.agri.ohio.gov/divs/dlep/dlep.aspx

ODH - Ohio Department of Health

Private Water Systems

http://www.odh.ohio.gov/odhprograms/eh/water/PrivateWaterSystems/main.aspx

Sewage Treatment Systems Program

http://www.odh.ohio.gov/odhPrograms/eh/sewage/sewage1.aspx

ODNR - Ohio Department of Natural Resources

http://www2.ohiodnr.gov/

Division of Water Resources (DWR)

http://water.ohiodnr.gov/

Division of Mineral Resources (DMR)

http://minerals.ohiodnr.gov/

Division of Oil and Gas Resources

http://oilandgas.ohiodnr.gov/

Division of Geologic Survey

http://geosurvey.ohiodnr.gov/

Ohio EPA - Ohio Environmental Protection Agency

http://www.epa.ohio.gov

Division of Drinking and Ground Waters (DDAGW)

http://www.epa.ohio.gov/ddagw/

Division of Surface Water (DSW)

http://www.epa.ohio.gov/dsw/

Division of Environmental and Financial Assistance (DEFA)

http://epa.ohio.gov/defa/

Division of Environmental Response and Revitalization (DERR)

http://www.epa.state.oh.us/derr/

Division of Materials and Waste Management (DMWM)

http://www.epa.ohio.gov/dmwm/

OWRC – Ohio Water Resource Council

http://www.epa.ohio.gov/dsw/owrc.aspx

SCCGW – State Coordinating Committee on Ground Water

http://epa.ohio.gov/ddagw/SCCGW.aspx

SFM/BUSTR – State Fire Marshall/ Bureau of Underground Storage Tank Regulations
http://www.com.ohio.gov/fire/

M3. Ohio's Major Aquifers

Introduction

Ohio has abundant surface and ground water resources. Average rainfall ranges between 30 and 44 inches/year (increasing from northwest to southeast), which drives healthy stream flows. Infiltration of a small portion of this rainfall (3-16 inches) recharges the aquifers and keeps the streams flowing between rains. Ohio's aquifers can be divided into three major types as illustrated in Figure M-1. The sand and gravel buried valley aquifers (in blue) are distributed through the state. The valleys filled by these sands and gravels are cut into sandstone and shale in the eastern half of the state (in tans) and into carbonate aquifers (in greens) in the western half. The buried valley aquifers are productive aquifers. The sandstone and carbonate aquifers generally provide sufficient production for water wells except where dominated by shale, as in southwest and southeast Ohio. An Ohio EPA report, *Major Aquifers in Ohio and Associated Water Quality* (2015), provides more detailed descriptions of these aquifers. This report is included here as Appendix A.

Characterizing Aquifers

In a continuing effort to characterize ground water quality for the professional/technical community and the general public, DDAGW is writing technical reports and fact sheets on the distribution of specific parameters in Ohio. The goal of these reports is to provide water quality information from the major aquifers, exhibit areas with elevated concentrations and identify geologic and geochemical controls. This information is useful for assessing local ground water quality, water resource planning and evaluating areas where specific water treatment may be necessary. A series of parallel fact sheets targeted for the general public provide basic information on the distribution of the selected parameters in ground water. The information in the fact sheets is presented in a less technical format, addresses health effects, outlines treatment options and provides links to additional information.

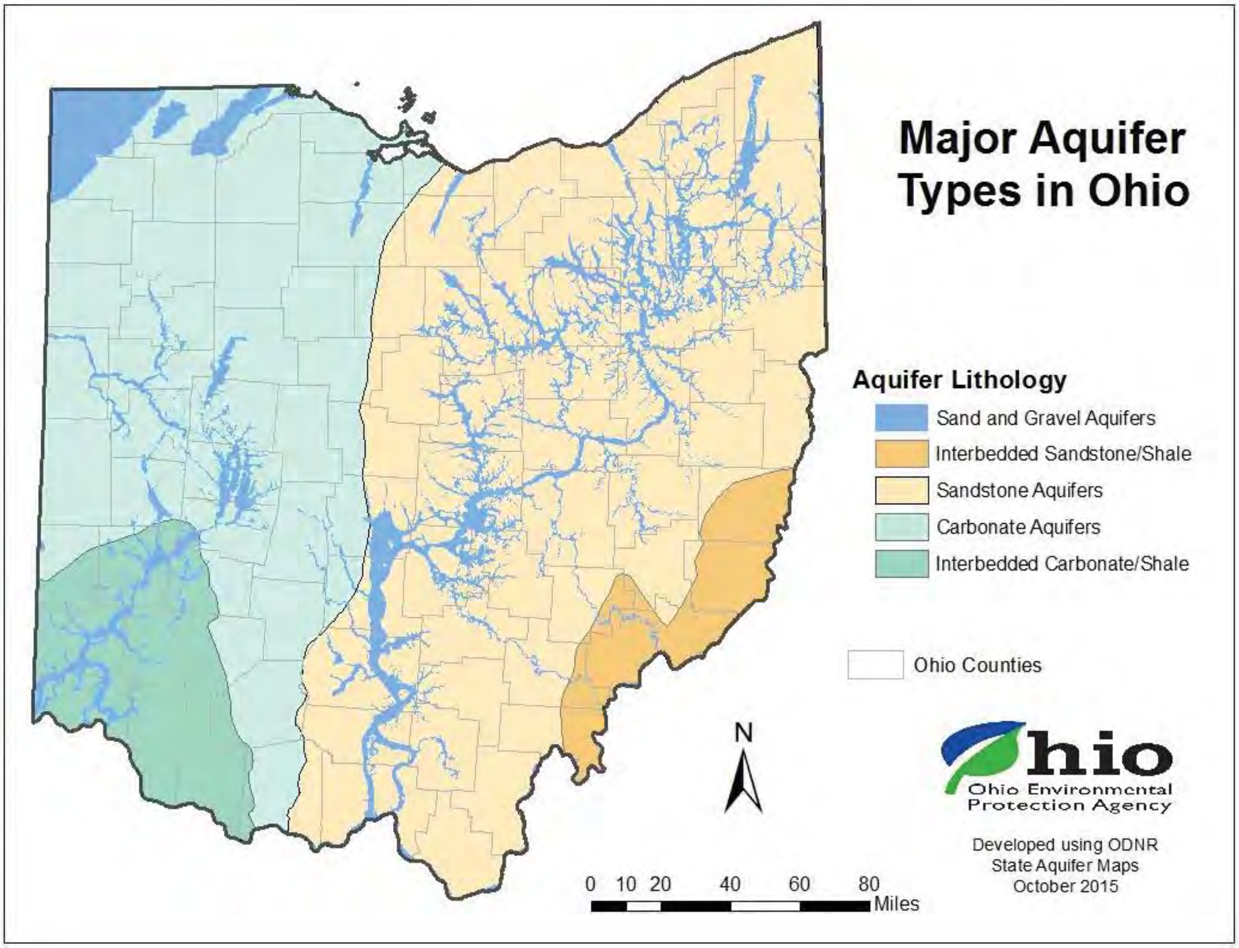


Figure M-1. Aquifer types in Ohio modified from ODNR glacial and bedrock aquifer maps
(ODNR, 2000; http://water.ohiodnr.gov/maps/statewide-aquifer-maps)

Since the Ohio 2014 Integrated Report, technical reports and fact sheets on reduction-oxidation (redox) control of water quality and distribution of strontium have been completed. The ***Major Aquifers in Ohio and Associated Water Quality*** report, included as Appendix A, was also completed and then updated in October 2015. The redox report is not structured around a constituent or group of constituents like the other technical reports. However, Reduction***-Oxidation (Redox) Control in Ohio's Ground Water Quality*** was completed to help ground water users understand the influence redox processes have on water quality. The redox condition of water is a conceptual framework for understanding the behavior of some common water quality parameters. For example, the iron staining of plumbing fixtures, ground water with a rotten egg smell and the presence of arsenic all relate to the redox state of the water. All bodies of water, from aquifers to streams to glasses of water, have redox states that are mediated by microbes and electron transfer reactions. The technical report focuses on a general understanding of redox as it relates to ground water quality, using Ohio raw water data to illustrate these relationships. Figure M-2 illustrates the depth related redox pair reactions (on right) with their redox zones (on left). Generally, ground waters are more reduced with increased depth below the water table. The report also includes several examples that show how redox concepts can be applied to understand the behavior and persistence of some common ground water contaminants, both natural and anthropogenic.

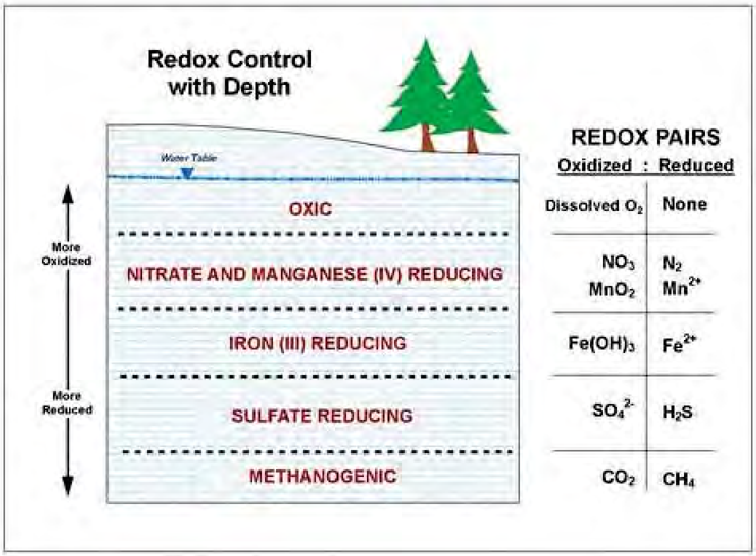


Figure M-2. Sequence of redox sensitive parameter changes with depth.

Strontium Distribution and Source

Based on the initial occurrence data on strontium collected for the Unregulated Contaminant Monitoring Rule 3 (UCMR3), the U.S. EPA made a preliminary determination in October 2014 to develop a drinking water standard for strontium. The U.S. EPA is continuing to evaluate information about strontium prior to making a final determination, but a final decision is not expected in 2016. Strontium concentrations in raw water in portions of Ohio carbonate aquifers are above health advisory levels. A draft technical report, ***Strontium in Ohio's Ground Water*** was generated to identify the areas in Ohio with elevated strontium and to identify the geologic and geochemical controls for the distribution.

In Ohio, the Silurian and Devonian carbonate aquifers in the western half of the state exhibit regional areas with strontium well averages up to 40,000 µg/L in raw water based on AGWQMP data. The sandstone aquifers exhibit the lowest strontium concentrations and the sand and gravel aquifers are intermediate. Strontium exceeds the life-time health advisory level (4,000 µg/L) in raw water in over 85 percent of the carbonate wells and 15 percent of the sand and gravel wells in the AGWQMP. The current distribution of the carbonate aquifers is controlled by the Findlay Arch and glacial erosion. The highest levels of strontium in ground water (>25,000 µg/L) occur within a north-south belt along and to the east of the crest of the Findlay Arch as illustrated in Figure M-3.

Strontium replaced calcium and/or magnesium during the depositional processes of marine carbonates and evaporite minerals. The Late Paleozoic secondary mineralization remobilized and/or added additional strontium and concentrated celestine along fractures and other open structures in carbonate aquifers. Natural dissolution of limestone, dolomite and gypsum are certainly contributing strontium to the groundwater, but the highest concentrations of strontium are not associated with the highest concentrations of calcium, magnesium and sulfate. Thus, it appears celestine also contributes strontium to ground water. Two factors likely to control the dissolution of celestine ($SrSO_4$) are the presence of gypsum and redox conditions. Gypsum is more soluble than celestine, so dissolution of gypsum should reduce the dissolution of celestine by raising the sulfate concentration. However, when reducing conditions cause the reductive dissociation of sulfate, the lowered sulfate concentrations increase the dissolution of sulfate

minerals, including celestine. The highest strontium concentrations are associated with stratigraphic units with little gypsum, indicating celestine is a significant contributor to the higher strontium concentrations.

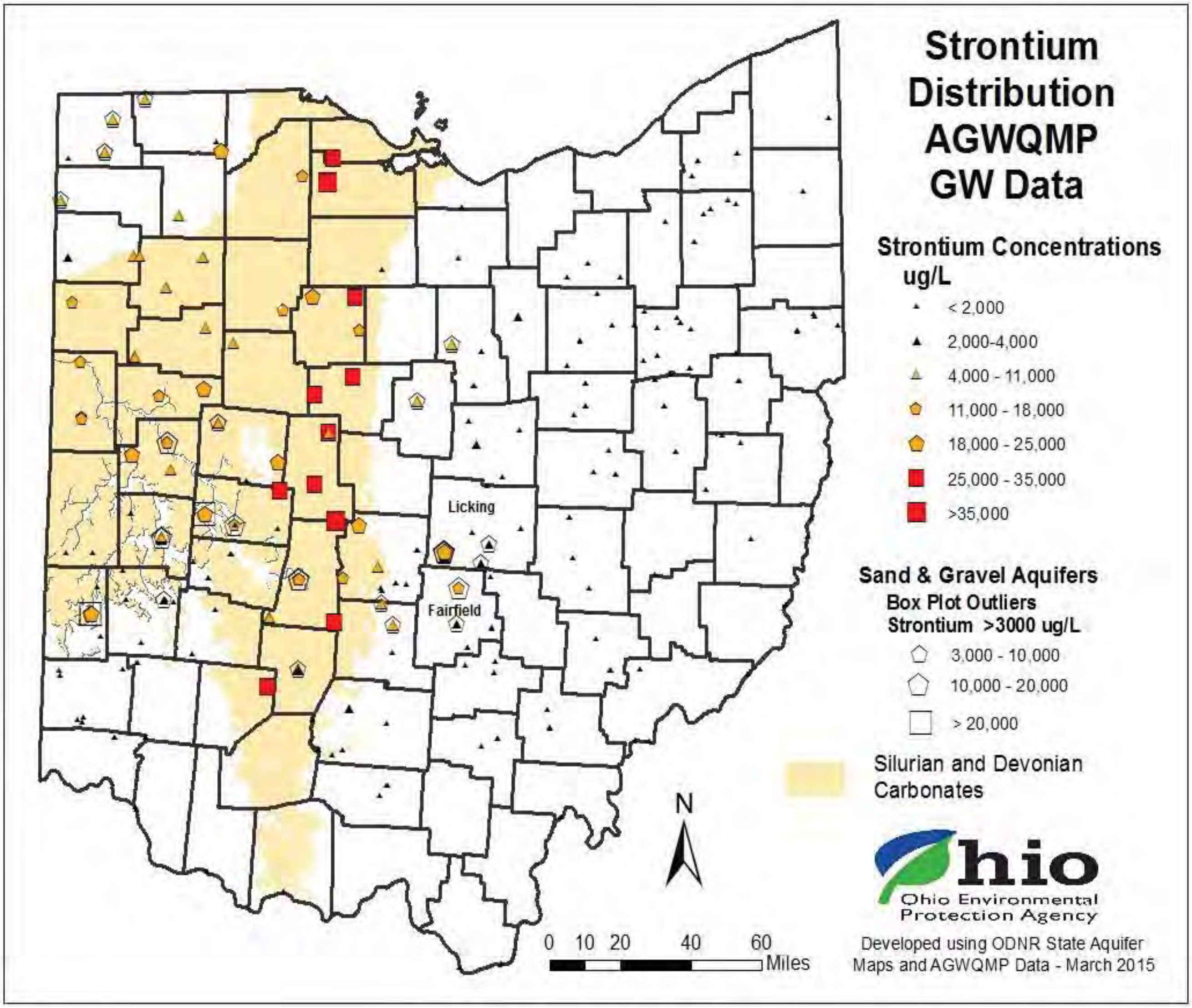


Figure M-3. Strontium distribution in Ohio.

M4. Site-Specific Ground Water Contamination Summary

Table M-2 (based on Table 5-3, U.S. EPA 305(b) Guidelines, 1997) provides a summary of the sites that have verified ground water contamination in Ohio. These data come from various state programs and the quality of these data is variable. Because the specific hydrogeologic settings for many of these sites is not included in the databases or is unknown, only a statewide summary is provided. Additional information is provided below for each program or subset of sites listed in Table M-2.

Table M-2. Ground Water Contamination Summary.
Hydrogeologic Setting: Statewide
Data Reporting Period: As of November, 2015

Source Type	Number of sites	Number of sites that are listed and/or have confirmed releases	Number of sites with confirmed ground water contamination	Contaminants
NPL - U.S. EPA	37 6 proposed	37	25	Mostly VOCs and heavy metals; also, SVOCs, PCBs, PAHs and others
CERCLIS (non-NPL) - U.S. EPA	419	419	20	Varied
DOD/DOE	128[a]	71	68	Varied
LUST	35,147[b]	1,904	165[c]	BTEX
RCRA Corrective Action	160	160	160	VOCs, heavy metals, PCBs and others
Underground Injection	Class[d]: I – 10 II – 411 III – 48 IV – 5 V – 49,727 49,727	 0 0 0 0 14,238	 0 0 0 0 NA	
State Sites [e]	772	772	254[f]	Varied GW Impacts
Nonpoint Sources	NA	NA	NA	

Notes: NA - Numbers not available

[a] Includes DOE, DOD, FUSRAP and FUD sites

[b] Includes only active LUST sites - Source: Ohio's State Fire Marshal, Bureau of Underground Storage Tank Regulations

[c] Sites in Tier 2 or Tier 3 cleanup stages. Source: Ohio's State Fire Marshal, Bureau of Underground Storage Tank Regulations

[d] Class I and V injection wells are regulated by Ohio EPA. Class II and Class III injection wells regulated by the Ohio Department of Natural Resources, Division of Oil and Gas Resources. Class IV injection wells are illegal in Ohio, except where approved as part of remediation plan.

[e] Facilities in Ohio EPA's Ground Water Impacts database

[f] A site is considered to be contaminating ground water if the "Uppermost Aquifer" or "Lower Aquifer" is noted to be impacted, as documented in Ohio EPA's Ground Water Impacts database.

Federal National Priorities List (NPL): Currently, 37 sites in Ohio are on the NPL, most of which (25) have been found to be affecting ground water quality. The primary contaminants are volatile organic chemicals (VOCs) and heavy metals.

CERCLIS (non-NPL): Ohio has 419 sites in the federal CERCLIS database.

DOD/DOE: The 128 sites on this list are the Department of Defense (DOD)/Department of Energy (DOE) sites in Ohio, including those that are Formerly Used Defense Sites (FUDS) and Formerly Utilized Sites Remedial Action Program (FUSRAP) sites. Of these, 68 have had confirmed releases to ground water.

Leaking Underground Storage Tanks (LUST): In Ohio, underground storage tanks (USTs) are under the jurisdiction of the State Fire Marshal, Bureau of Underground Storage Tank Regulation (BUSTR). Current data indicates that more than 35,000 sites have been found to be leaking. Of these, 1,904 have confirmed releases, with 165 having a release to ground water. The primary contaminants are the petroleum products of benzene, toluene, ethyl benzene and xylenes (BTEX).

RCRA Corrective Action: Currently, 160 facilities are in RCRA corrective action. All of these have confirmed releases to ground water. The primary contaminants are VOCs and heavy metals. This information was obtained from the RCRA Facility Database, an internal DDAGW tracking system.

Underground Injection: There are five classes of underground injection wells:

1) Class I wells inject hazardous wastes or other wastewaters beneath the lowermost aquifer;
2) Class II wells inject brines and other fluids associated with oil and gas production beneath the lowermost aquifer;
3) Class III wells inject fluids associated with solution mining of minerals beneath the lowermost aquifer;
4) Class IV wells inject hazardous or radioactive wastes into or above aquifers (these wells are banned unless authorized under a federal or state ground water remediation project;
5) Class V wells comprise all of the injection wells not included in Classes I-IV.

The Ohio Department of Natural Resources, Division of Oil and Gas Resources regulates Class II (411) and Class III (48) wells. The number of Class II brine injection wells (one of three types of class II wells) is increasing because of their use in disposal of fluids used in oil and gas drilling and shale gas development. In addition to the 210 active brine injection wells there are 17 wells that are drilled or being drilled and 18 that are permitted.

Ohio EPA DDAGW regulates Class I (10), Class IV (5) and Class V (+49,727) wells. Although owners and operators of Class V wells are required to register or permit their wells, there are still many that are unknown and unregistered throughout the state.

State Sites: State sites include landfills, RCRA-regulated hazardous waste facilities, unregulated sites (pre-RCRA) and sites investigated through the Voluntary Action Program (VAP). Ground water contamination summary information concerning many of these sites is tracked in the Ground Water Impacts Database, maintained by Ohio EPA - DDAGW. The database consists of sites with verified contaminant release to ground water. As of November 2015, the database contained 772 sites. Of the 772 sites, 254 have affected ground water quality within the uppermost aquifer or lower aquifer.

M5. Major Sources of Ground Water Contamination

Data show much of Ohio's ground water is of high quality and has not been widely influenced by anthropogenic activities, but individual cases of contamination are documented every year from point (site-specific locations) and nonpoint sources. Ohio has a diverse economy and the state uses and produces a range of potential contaminants applied, stored and disposed of in various land use practices. Consequently, ground water quality is susceptible to contamination from a range of substances and a variety of land use activities. Selecting major sources of contamination is subjective because the selection is scale-dependent. For an individual with contaminated water, the major source is the source that contaminates their well, regardless of the major sources identified for the state. From a statewide perspective, major sources are discussed below.

The ten major sources of ground water contamination in Ohio are indicated in Table M-3 (Table 5-1, U.S. EPA 305(b) Guidelines, 1997) by checks (✓). These data were obtained from two main sources: Ohio's Source Water Assessment and Protection (SWAP) Program and DDAGW's Ground Water Impacts Database. The SWAP Program has completed an inventory of the potential sources of ground water contamination in the delineated Drinking Water Source Protection Areas. This inventory is updated when the SWAP delineation is revised, for example, when new wells are approved. Ninety-nine percent of active public water systems that use ground water have had an inventory conducted, an analysis of the aquifer's susceptibility to contamination completed and a determination of whether the ground water quality has been impacted by anthropogenic activities. The Ground Water Impacts Database provides information regarding sites where contamination of ground water has been confirmed. These data were evaluated and those sources of highest concern were given a check mark (✓) in Table M-3.

Some of the "potentially high priority" sources, indicated by crosses (×), were selected based on professional knowledge of the types of sources that exist in Ohio. These sources, such as animal feedlots and mining, are limited in their extent, or are concentrated in regions of the state and may not be sited close to public water system well fields. Thus, they do not rank in the highest priority sources. However, where they are prevalent, these sources may be a threat to local ground water resources, especially in areas with sensitive hydrogeologic settings. Land use activities within sensitive areas have a greater potential of affecting ground water quality

Table M-3. Major sources of potential ground water contamination.

Contaminant Source	Highest-Priority Sources	Factors Considered in Selecting a Contaminant Source	Contaminants
Agriculture Activities			
Agricultural chemical facilities			
Animal feedlots	×	4, 5, 6, 8	E, J, K, L
Drainage wells			
Fertilizer applications (manure application)	✓	1, 2, 3, 4, 5, 8	E, J, K, L
Irrigation practices			
Pesticide applications			
On-farm agricultural mixing and loading			
Land application of manure			
Storage and Treatment Activities			
Land application			
Material stockpiles			
Storage tanks (above/below ground)	✓	1, 2, 3, 4, 5, 6, 7	C, D, H, M
Surface impoundments	×	6	G, H, M
Waste piles			
Waste tailings			
Disposal Activities			
Deep injection wells			
Landfills	✓	1, 2, 3, 4, 5, 6	A, B, C, D, H, M
Septic systems	✓	1, 2, 3, 4, 5, 6	E, H, J, K, L
Shallow injection wells	✓	1, 2, 3, 4, 5, 6, 8	C, D, G, H, M
Other			
Hazardous waste generators			
Hazardous waste sites	✓	1, 2, 3, 4, 5, 6, 7	A, B, C, D, H, I, M
Large industrial facilities			
Material transfer operations			
Mining and mine drainage	×	6, 8	G, H
Pipelines and sewer lines	✓		D, E, J, K, L
Salt storage and road salting	✓	6	G
Spills	×	6	C, D, H, M
Transportation of materials			
Urban runoff (storm water management, storm drains)	✓	2, 4	A, B, C, D, G, H, J
Small-scale manufacturing and repair shops	✓	4, 6	C, D, H, M

Notes: (✓) Highest Priority
(×) Potentially High Priority

Factor and Contaminant codes on next page.

FACTORS	CONTAMINANTS
1. Human health and/or environmental risk (toxicity)	A. Inorganic pesticides
2. Size of the population at risk	B. Organic pesticides
3. Location of the sources relative to drinking water sources	C. Halogenated solvents
4. Number and/or size of contaminant sources	D. Petroleum compounds
5. Hydrogeologic sensitivity	E. Nitrate
6. State findings, other findings	F. Fluoride
7. Documented from mandatory reporting	G. Salt/Salinity/brine
8. Geographic distribution/occurrence	H. Metals
	I. Radionuclides
	J. Bacteria
	K. Protozoa
	L. Viruses
	M. Other (VOCs)

Contaminant Source Discussion - All of the sources listed in Table M-3 are potential contaminant sources in Ohio and each may cause ground water quality impacts at a local scale. The sources identified as "highest priority" or "potentially high priority" are listed below in the order presented in Table M-3 and discussed briefly to provide additional information.

(✓) Highest Priority Sources

- **Fertilizer Applications**: Use and handling of fertilizers, manure and biosolids can cause ground water pollution. Human and animal biosolids used as fertilizer and chemical fertilizers contribute to nitrate contamination in ground water. Nitrate concentrations in ground water represent one of the better examples of the widespread distribution of nonpoint source pollution. Non-agricultural sources, such as lawn fertilization, sludge application and septic systems also contribute to localized nitrate ground water contamination. Public water systems utilizing sand and gravel aquifers have higher average nitrate levels than public water systems using sandstone and carbonate aquifers, primarily due to the higher vulnerability of unconsolidated aquifers and the shallower nature of the sand and gravel aquifers.

- **Storage Tanks (Underground and Above-ground):** There are 1,904 USTs known to be leaking or undergoing remediation in Ohio. Of these, 332 have been located in drinking water source protection areas for public water systems using ground water. Above-ground tanks are also prevalent throughout Ohio, with 1,284 located in a drinking water source protection area for public water systems using ground water. Many of these are smaller tanks used to store fuel oil for heating individual homes and many are old and rusty with no containment in the event of a leak or spill. Leaking above-ground storage tanks (ASTs) from commercial and industrial facilities are less of an issue, although catastrophic failure can create significant pollution problems to both ground water and surface water. There are only 21 ASTs in the Ground Water Impacts database known to be contaminating ground water from regulated hazardous waste facilities.

- **Landfills:** Currently, there are 128 landfills with documented ground water contamination in Ohio. This constitutes 50 percent of the sites known to be affecting ground water quality based on information in Ohio EPA's Ground Water Impacts database. Most likely, these are from older, unlined landfills (many of which are closed) or construction and demolition debris landfills (C&DD) with limited

construction standards. The current siting, design and construction standards for landfills are more stringent than twenty years ago, with the result that new landfills have significantly lower potential to impact ground water quality. Efforts to monitor C&DD landfills and characterize associated ground water quality impacts were reduced in 2015.

- **Septic Systems:** Over 1,000,000 household wastewater systems, primarily septic tanks and leach fields, or in some cases injection wells, are present throughout the rural and unsewered suburban areas of Ohio. A number of these systems are improperly located, poorly constructed, or inadequately maintained and may cause bacterial and chemical contamination of ground water which may supply water to nearby wells. Improperly operated and maintained septic systems are considered significant contributors to elevated nitrate levels in ground water in vulnerable geologic settings (e.g., shallow fractured bedrock and sand and gravel deposits). Over 2,000 septic systems are located in drinking water source protection areas. The updated Household Sewage Treatment Systems Rules became effective on January 1, 2015 (Ohio Revised Code Chapter 3718 and Ohio Administrative Code 3701-29) and should help correct deficiencies of failing septic systems.

- **Shallow Injection Wells:** Class V injection wells are widespread throughout the state. High concentrations of Class V injection wells are most likely found in areas with sensitive sand and gravel aquifers. It is estimated that Ohio has over 50,000 class V injection wells. The fact that these wells are used to inject fluids directly into vulnerable aquifers in the State is the main cause for concern. These shallow injection wells provide a direct pathway for nonpoint source contamination and illegal waste disposal into vulnerable aquifers. Ohio has closed 591 motor vehicle waste disposal wells (e.g., oil, radiator fluids, etc.) since 2000.

- **Hazardous Waste Sites:** Ohio generates a large amount of hazardous waste. Legacy hazardous waste sites are a serious threat to ground water. There are 63 RCRA hazardous waste facilities, 15 Voluntary Action Program sites and 61 unregulated hazardous waste remediation sites (pre 1980) with documented releases to ground water (uppermost or lower aquifer) based on the Ground Water Impacts Database.

- **Pipelines and Sewer Lines:** Pipelines and sewer lines all have potential for failure with release of the transported material. In addition, the construction of these lines, with the pipe embedded in permeable material, allows the trench to provide rapid flow paths for other surface contaminants. This is especially true if the trench is dug into fractured bedrock. Numerous gas, oil and industrial pipelines (1,215) and sewer lines (831) have been inventoried in drinking water source water protection areas.

- **Salt Storage and Road Salting:** The widespread use of salt or mixtures of salt and sand for deicing roads has been documented as a nonpoint source contributor of sodium and chloride contamination of shallow ground water (Jones and Sroka 1997; Mullaney et al. 2009). Spreading of salt on roads certainly contributes to ground water quality impacts, but the greatest local impact is associated with salt storage. In 2012-2014, Ohio EPA documented impacts to ground water at numerous salt storage facilities, including salt storage piles in drinking water source protection areas. Eighty-one (81) salt storage piles were identified in or near drinking water source protection areas with 62 of these located in sensitive aquifer settings. Most of these sites had adequate covering and pads. Ten sites were selected for additional investigation, two of which exhibited elevated chloride concentrations in ground water due to leaching of brine from the salt pile. In addition to addressing these sites, Ohio is exploring ways to encourage implementation of BMPs for proper salt storage.

Alternative chemicals like acetate-based deicers in combination with reduced salt usage are being promoted in pollution prevention programs. The workgroup, consisting of members from the Ohio Water Resources Council and the State Coordinating Committee on Ground Water, developed guidance for salt storage in 2013: *Recommendations for Salt Storage: Guidance for Protecting Ohio's Water Resources*, located on the web at: http://epa.ohio.gov/portals/35/owrc/SaltStorageGuidance.pdf

- **Suburban Runoff (including storm drains and storm water management):** With expanding suburban areas, nonpoint source contamination from suburban/urban runoff is an increasing source of ground water contamination, in contrast with most of the other sources discussed. In addition, the practice of constructing storm water retention basins increases the likelihood that storm water runoff infiltrates into ground water. More than 1,200 storm drains have been located in drinking water source protection areas, with many of these going directly to nearby water bodies. Elevated chloride is documented in urban areas within glacial aquifers by Mullaney et al. (2009) and positive trends in chloride concentrations in Ambient Ground Water Quality Monitoring data are present at some sites.

- **Small-Scale Manufacturing and Repair Shops:** Small-scale manufacturing and repair shops include 1693 facilities in drinking water source protection areas. These include: auto and boat repair shops and dealers, gas stations, junk yards, equipment rental and repair, machine shops, metal finishing and welding shops and other various small businesses. These businesses typically handle chlorinated solvents (for cleaning) and petroleum products. Limited knowledge of best management practices for handling and disposing of these products increases the risk of impacting ground water.

(✖) Potentially High Priority Sources

- **Concentrated Animal Feeding Operations (CAFO):** The growth of CAFOs in numbers and size makes them a significant potential source if the waste is not properly managed. The ground water threats associated with CAFOs are captured in other categories as well, such as manure, sludge and fertilizer application and surface impoundments, so they are not considered one of the ten highest priority sources. Improper storage or management of the animal waste is the greatest threat to ground water contamination in sensitive hydrogeologic settings, but land application in solid or liquid form also poses risks for ground and surface water contamination.

- **Surface Impoundments:** Surface impoundments are one of the most common waste disposal concerns at RCRA facilities. Historically, they have been a major source for ground water contamination. Older impoundments were not subject to the same engineering standards as newer impoundments and, consequently, the probability of fluids leaching to the ground water was greater. Current siting and engineering requirements have improved this situation. Fifty-four (54) surface impoundments are known to be contaminating ground water based on information obtained from Ohio EPA's Ground Water Impacts database, the vast majority being from regulated and unregulated hazardous waste facilities.

- **Mining and Mine Drainage:** The bedrock (Pennsylvanian Units) that underlies eastern Ohio includes significant coal resources. The disruption of the stratigraphic units and oxidation of sulfides associated with coal mining produces ground water contamination by acid mine waters. Acid mine waters are considered a significant threat to ground water in mined areas.

- **Spills and Leaks:** Leaks and spills of hazardous substances from underground tanks, surface impoundments, bulk storage facilities, transmission lines and accidents are major ground water pollution threats. More than a thousand leaks and spills are reported each year. This release of chemicals on to the surface and into near surface environments is certainly one of the greatest threats to ground water quality. The development of shale gas and associated hydrofracturing activity in eastern Ohio has raised concerns about potential for aquifer impacts. Historically, the surface management of brines has been the greatest cause of ground water contamination associated with oil production and hydro fracking activities (State Oil and Gas Agency Groundwater Investigations; and Their Role in Advancing Regulatory Reforms, GWPC, August 2011). Revised regulations address the management and disposal of oil and gas production brines with the preferred mode of disposal as injection into Class II injection wells.

  The major sources of ground water contamination listed include point and nonpoint sources in roughly equal proportions. In strict terms, a point source is a discharge from a discernable, confined and discrete conveyance, but in practical terms, the distribution or spatial scale of a contaminant controls the designation of a source as point or nonpoint. For example, salt applied for de-icing along roads exhibits nonpoint source behavior, while salt stockpiles behave more like point sources, with the potential for continual release of concentrated brine that may affect ground water quality. This dichotomy is typical of many agricultural contaminants, manure spreading versus storage, fertilizer application versus storage or mixing sites. In Ohio, we generally have better documentation of ground water contamination associated with point source contamination than nonpoint source contamination due to the extensive ground water monitoring programs at regulated facilities.

  Rapid runoff in glacial till areas overlying much of Ohio and drainage tiling have protected many of Ohio's aquifers from traditional nonpoint source pollution sources such as nitrate, chloride, pesticides or bacteria. In sensitive settings (e.g., sand and gravel aquifers, shallow bedrock aquifers), indicators of nonpoint source pollution are more clearly identified in Ohio's Ambient Ground Water Quality Monitoring Program and the public water system compliance monitoring data. However, these monitoring programs do not focus on shallow aquifers, which have a higher likelihood of being influenced by nonpoint source pollution such as agricultural practices.

M6. Summary of Ground Water Quality by Aquifer

Tables M-4A and M-4B (Table 5-4, U.S. EPA 305(b) Guidelines, 1997) summarize water quality compliance data from Ohio public water systems and raw water data from the AGWQMP, respectively. The compliance data for public water systems in Ohio (Table M-4A) documents water quality for treated water (post processing) and some raw (untreated) water quality (like new well samples). Parameters generally unaffected by standard treatment, such as nitrate, may be used to characterize Ohio's ground water quality because post treatment values are similar to ground water values. DDAGW created the AGWQMP program (Table M-4B) to monitor "raw" (untreated) ground water. This program's goal is the collection, maintenance and analysis of raw ground water quality data to measure long-term changes in the water quality of the Ohio's major aquifer systems.

Ohio does not have statewide ground water quality standards, so data for the major aquifers are compared to primary maximum contaminant level (MCL) or secondary maximum contaminant level (SCML). Primary MCLs are the highest level of a contaminant that is allowed in public drinking water and are set as close to MCL Goals (a health-based standard) as feasible using the best available treatment technology and economic

considerations. Primary MCLs are enforceable standards. Secondary MCLs are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water.
Primary and secondary MCLs are used as practical benchmarks for water quality characterization in Tables M-4A and M-4B. Fifty percent of the MCL to 100 percent of the MCL is used as the range for the **"watch list"** determination. The public water systems or wells identified in this category may warrant additional monitoring to identify increasing trends. MCL exceedances are used as the criteria for the **"impaired"** category. Tables M-4A and M-4B were generated using the last 10 years of data (1/1/2005-12/31/2014). Mean concentrations of a parameter are used for deciding if a public water system or well is included in the watch list (50 percent to 100 percent MCL) or impaired category (> MCL). Maximum concentrations of nitrate and nitrite are reported in these tables instead of averages, due to the acute nature of their health concerns.

Public Water System Compliance Data

Mean values were calculated from public water system compliance data for 2005-2014 to determine the number of public water systems on the watch list and in the impaired category. A ten-year period of record was used to increase the statistical significance of the determination due to the infrequent sampling requirements (e.g., once per three-year period). **public water systems included in the impaired category may not match Safe Drinking Water Act regulatory determinations of a violation due to the method of calculation.** An MCL exceedance for compliance is generally an annual average, so the **decadal average presented in Table M-4A is not a compliance number**, but rather a comparison to MCL values, as a benchmark to identify public water systems in the watch list and impaired categories.

Table M-4A lists all parameters with MCLs (and SMCLs) and summarizes the number of public water systems in the watch list and impaired category for both raw and treated water quality data. The results for each parameter are further divided into major aquifer type categories. The total number of public water systems with data used in these determinations is presented to allow comparison of the total number of public water systems to those that exhibit elevated concentrations of MCL parameters. Data from active and inactive systems is included in Table M-4A. For parameters with SMCLs, treated water data is limited or absent because compliance data is generally not required for aesthetic water quality issues.

Table M-4A. Counts of public water systems where 2005-2014 decadal mean values of compliance data occur in the Watch List and Impaired Category.
Note: presented by major aquifer types.

Chemical Group	Chemical	Standard Type	Standard	Major Aquifer	Public Water Systems					
					Raw Water			Treated Water		
					Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL	Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL
Inorganics	Antimony	MCL	6 µg/L	Sand and Gravel	268	2		703	6	
				Sandstone	285	5	1	707	7	1
				Carbonate	246	4		449	5	1
	Arsenic	MCL	10 µg/L	Sand & Gravel	344	59	66	706	87	44
				Sandstone	309	20	20	714	48	11
				Carbonate	301	53	50	449	65	36
	Asbestos	MCL	$7x10^6$ fibers/L	Sand and Gravel	35			169		
				Sandstone	10			50		
				Carbonate	11			62		
	Barium	MCL	2 mg/L	Sand and Gravel	278	4		704	5	
				Sandstone	294	6	1	709	2	
				Carbonate	245	1	1	448	1	
	Beryllium	MCL	4 µg/L	Sand and Gravel	268	2		703		1
				Sandstone	286			708		
				Carbonate	244			448		
	Cadmium	MCL	5 µg/L	Sand and Gravel	274		1	703	1	
				Sandstone	286		1	708	2	
				Carbonate	244			448		
	Chloride	SMCL	250 mg/L	Sand and Gravel	248	5	1			
				Sandstone	285	15	10			
				Carbonate	236	3	2			
	Chromium	MCL	0.1 mg/L	Sand and Gravel	271			703		
				Sandstone	284	1	1	716	1	
				Carbonate	246			448		
	Cyanide	MCL	0.2 mg/L	Sand and Gravel	259			703	1	
				Sandstone	284			708		
				Carbonate	242			448		

Chemical Group	Chemical	Standard Type	Standard	Major Aquifer	Public Water Systems					
					Raw Water			Treated Water		
					Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL	Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL
Inorganics	Fluoride	MCL	4 mg/L	Sand and Gravel	286	1		703	6	
				Sandstone	291	1		708	1	
				Carbonate	254	21		448	20	
	Iron	SMCL	0.3 mg/L	Sand and Gravel	278	14	163			
				Sandstone	286	37	144	1		
				Carbonate	267	22	141	1		1
	Manganese	SMCL	0.05 mg/L	Sand and Gravel	251	40	107			
				Sandstone	286	32	146	1		
				Carbonate	238	42	45	1		1
	Mercury	MCL	2 µg/L	Sand and Gravel	266		1	703		
				Sandstone	286			708		1
				Carbonate	244			448		
	Nitrate * (Max Value)	MCL	10 mg/L	Sand and Gravel	329	16	10	1608	57	17
				Sandstone	322	6	4	2053	31	5
				Carbonate	274	6	8	1413	37	2
	Nitrite * (Max Value)	MCL	1 mg/L	Sand and Gravel	306			1616	1	
				Sandstone	305			2061	3	2
				Carbonate	256			1421	1	3
	Selenium	MCL	50 µg/L	Sand and Gravel	269			703		
				Sandstone	287			708		
				Carbonate	245	2		448		
	Silver	SMCL	0.1 mg/L	Sand and Gravel	238		1			
				Sandstone	273			1		
				Carbonate	229		1			
	Solids, Total Dissolved	SMCL	500 mg/L	Sand and Gravel	116	50	30			
				Sandstone	159	71	32			
				Carbonate	137	23	79			

Chemical Group	Chemical	Standard Type	Standard	Major Aquifer	Public Water Systems					
					Raw Water			Treated Water		
					Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL	Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL
Inorganics	Sulfate	SMCL	250 mg/L	Sand and Gravel	273	17	15			
				Sandstone	292	12	17			
				Carbonate	255	30	83			
	Thallium	MCL	2 µg/L	Sand and Gravel	267	2	1	703	3	
				Sandstone	285		1	708	2	1
				Carbonate	244	1		448		1
	Zinc	SMCL	5.0 mg/L	Sand and Gravel	145					
				Sandstone	142			1		
				Carbonate	124					
Volatile Organic Chemicals	1,2-Dichloroethane	MCL	5 µg/L	Sand and Gravel	308	1		706		
				Sandstone	319			716		1
				Carbonate	263			453		1
	1,1-Dichloroethylene	MCL	7 µg/L	Sand and Gravel	309			707		
				Sandstone	319		1	716		1
				Carbonate	263			453		
	1,2-Dichloropropane	MCL	5 µg/L	Sand and Gravel	310		1	707		1
				Sandstone	320			716		
				Carbonate	263			453	1	
	1,1,1-Trichloroethane	MCL	200 µg/L	Sand and Gravel	310			707		
				Sandstone	320			716		
				Carbonate	263			453		
	1,1,2-Trichloroethane	MCL	5 µg/L	Sand and Gravel	310			707		
				Sandstone	320			716		
				Carbonate	263			453		
	1,2,4-Trichlorobenzene	MCL	70 µg/L	Sand and Gravel	310			707		
				Sandstone	319			716		
				Carbonate	263			453		

Chemical Group	Chemical	Standard Type	Standard	Major Aquifer	Public Water Systems					
					Raw Water			Treated Water		
					Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL	Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL
Volatile Organic Chemicals	Benzene	MCL	5 µg/L	Sand and Gravel	309		2	707		
				Sandstone	320			716		
				Carbonate	261			453		
	Carbon Tetrachloride	MCL	5 µg/L	Sand and Gravel	310			707		
				Sandstone	320	1	1	716		
				Carbonate	263		1	453		
	Chlorobenzene?	MCL	100 µg/L	Sand and Gravel	310			707		
				Sandstone	319			716		
				Carbonate	263			453		
	Cis-1,2-Dichloroethylene	MCL	70 µg/L	Sand and Gravel	310			707		
				Sandstone	319			716		
				Carbonate	263			453		
	Dichloromethane	MCL	5 µg/L	Sand and Gravel	309	2	1	707	2	1
				Sandstone	314	1	1	716		1
				Carbonate	262		1	453	1	1
	Ethyl benzene	MCL	700 µg/L	Sand and Gravel	310			707		
				Sandstone	320			716		
				Carbonate	263			453		
	o-Dichlorobenzene	MCL	600 µg/L	Sand and Gravel	310			707		
				Sandstone	319			716		
				Carbonate	263			453		
	p-Dichlorobenzene	MCL	75 µg/L	Sand and Gravel	310			707		
				Sandstone	318			716		
				Carbonate	263			453		
	Pentachlorophenol	MCL	1 µg/L	Sand and Gravel	5			96		
				Sandstone				43		
				Carbonate	1			19		

Chemical Group	Chemical	Standard Type	Standard	Major Aquifer	Public Water Systems					
					Raw Water			Treated Water		
					Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL	Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL
Volatile Organic Chemicals	Styrene	MCL	100 µg/L	Sand and Gravel	310			707		
				Sandstone	320			716		
				Carbonate	263	1		453		
	Tetra-chloroethylene	MCL	5 µg/L	Sand and Gravel	310	3	3	707	3	
				Sandstone	320	1	2	716	1	1
				Carbonate	263			453	1	
	Toluene	MCL	1000 µg/L	Sand and Gravel	310			707		
				Sandstone	319			716		
				Carbonate	263			453		
	Trans-1,2-Dichloroethylene	MCL	100 µg/L	Sand and Gravel	310			707		
				Sandstone	320			716		
				Carbonate	263			453		
	Trichloroethylene	MCL	5 µg/L	Sand and Gravel	310	3		707		
				Sandstone	320		1	716	1	
				Carbonate	262	1	1	453	1	
	Vinyl Chloride	MCL	2 µg/L	Sand and Gravel	310	3	2	706		2
				Sandstone	319			716		
				Carbonate	263			453		
	Xylenes, Total	MCL	10 mg/L	Sand and Gravel	309			707		
				Sandstone	316			716		
				Carbonate	262			453		
Pesticides and Synthetic Organic Chemicals	Alachor (Lasso)	MCL	2 µg/L	Sand and Gravel	259			708		
				Sandstone	280			717		
				Carbonate	232			453		
	Atrazine	MCL	3 µg/L	Sand and Gravel	258			708		
				Sandstone	281			717		
				Carbonate	232			453		

Chemical Group	Chemical	Standard Type	Standard	Major Aquifer	Public Water Systems					
					Raw Water			Treated Water		
					Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL	Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL
Pesticides and Synthetic Organic Chemicals	Benzo(a)pyrene	MCL	0.2 µg/L	Sand and Gravel	3			95	1	
				Sandstone				47		
				Carbonate	2			20		
	Carbofuran	MCL	40 µg/L	Sand and Gravel	3			96		
				Sandstone				43		
				Carbonate	1			19		
	Di(2-ethylhexyl) adipate	MCL	400 µg/L	Sand and Gravel	4			95		
				Sandstone				47		
				Carbonate	4			20		
	Di(2-ethylhexyl) phthalate	MCL	6 µg/L	Sand and Gravel	4			98		2
				Sandstone				48		
				Carbonate	4	1		22		2
	Dinoseb	MCL	7 µg/L	Sand and Gravel	5					
				Sandstone						
				Carbonate	1					
	Diquat	MCL	20 µg/L	Sand and Gravel	3			99		
				Sandstone				44		
				Carbonate	1			18		
	Endothall	MCL	100 µg/L	Sand and Gravel	3			95		
				Sandstone				47		
				Carbonate	1			20		
	Ethylene Dibromide	MCL	0.05 µg/L	Sand and Gravel	6					
				Sandstone						
				Carbonate						
	Glyphosate	MCL	700 µg/L	Sand and Gravel	3			96		
				Sandstone				44		
				Carbonate	1			18		

Chemical Group	Chemical	Standard Type	Standard	Major Aquifer	Public Water Systems					
					Raw Water			Treated Water		
					Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL	Total # public water systems	Watch List > 50% to 100% MCL	Impaired > MCL
Pesticides and Synthetic Organic Chemicals	Methoxychlor	MCL	40 µg/L	Sand and Gravel	4			96		
				Sandstone	1			44		
				Carbonate	1			18		
	Simazine	MCL	4 µg/L	Sand and Gravel	258			708		
				Sandstone	281			717		
				Carbonate	232			453		
	Total Polychlorinated Biphenyls (PCBs)	MCL	0.5 µg/L	Sand and Gravel	3			96		
				Sandstone	1			44		
				Carbonate				18		
Organic Disinfection By-Products	Total Haloacetic Acids (HAA5)	MCL	60 µg/L	Sand and Gravel	80	3	1	528	4	2
				Sandstone	51		1	404	8	3
				Carbonate	55	1	1	276	3	2
	Total Trihalomethanes (TTHM)	MCL	80 µg/L	Sand and Gravel	119	6	4	527	38	6
				Sandstone	61	2	1	403	14	2
				Carbonate	61	5	3	276	22	2
Radiological	Gross Alpha (incl. + excl.)	MCL	15 pCi/L	Sand and Gravel	271	1		419	1	
				Sandstone	293	5		261	2	1
				Carbonate	246	15	3	187	2	
	Gross Beta	MCL	4 mrem/yr**	Sand and Gravel	152	2	34			
				Sandstone	169	2	48			
				Carbonate	137	2	45			
	Radium 226	MCL	5 pCi/L***	Sand and Gravel	22			1		
				Sandstone	27	2	1	3		
				Carbonate	43	6	2	1		
	Radium 228	MCL	5 pCi/L***	Sand and Gravel	142			421	1	
				Sandstone	155	3	2	265	4	1
				Carbonate	140	2		187	1	

Blank spaces indicate no PWSs exceed the standards (zeros left out to highlight impacted public water systems); "nda" indicates no data available

* Numbers for nitrate and nitrite are based on maximum values to reflect the acute nature of the contaminant.
** If Gross Beta result is less than 50 pCi/L no conversion to mrem/yr is necessary - table used 50 pCi/L as standard.
*** MCL is for combined Radium 226 and Radium 228

With the exception of a new well analysis, there are no requirements for collecting and reporting raw water data, so the number of public water systems with raw water data is less than the number with treated water data. The public water system data were linked to geologic settings using the DDAGW Source Water Assessment data, which allowed the breakout of the data by major aquifer. In this analysis, any detection in raw water data was used to generate public water system averages. For treated water data, public water system averages were generated only if there were at least two detections of a parameter. The inorganic parameters that place numerous public water systems in the watch list and impaired category warrant additional analysis.

The number of public water systems in the watch list and the impaired categories of Table M-4A are generally low; however, several parameters do exhibit higher numbers of public water systems in these groups. Fortunately, most of these occurrences are for secondary MCLs, not primary MCLs. That is, the water quality impacts documented are mostly aesthetic issues and are not health-based. Groups of parameters are discussed individually.

Inorganic Parameters MCL Parameters
Only a few public water systems fall into the watch list or the impaired MCL category based on inorganic parameters. For treated water data, parameters with MCLs and no public water systems in the impaired category (values > MCL) include**, asbestos, barium, cadmium, chromium, cyanide, fluoride and selenium.** The use of detection limits at or greater than 50 percent of the MCL and using the reporting limit for the non-detect value can result in public water systems placed in the watch list with no detection of the parameter. The data has been reviewed to assure that public water system in the watch list have detected the parameter. Factors limiting the number of public water systems in these categories include limited solubility of the substance in water, low crustal abundance, local geology and possibly treatment. For example, in treated water, no public water systems that exceed the fluoride MCL, but 27 public water systems that draw water from carbonate aquifers, exceed 50 percent of the MCL. This association is controlled by secondary fluorite mineralization along fractures and voids in limestone in northwest Ohio.

Several parameters including **antimony, beryllium, mercury and thallium** have low numbers of public water systems in the MCL impaired category for treated water. This small number is consistent with the low solubility and scarcity of these metals in Ohio's geology. The use of decadal averages for building both watch list and impaired categories may overestimate the numbers of public water systems when compared with actual MCL or SMCL calculations which use annual averages.

The number of public water systems with **arsenic** in raw water and treated water above the MCL (136 and 91, respectively) is consistent with the number of public water systems that DDAGW worked with to reduce arsenic to meet the 2006 revised MCL of 10 µg/L. These systems are associated with reduced ground water and local areas of naturally occurring arsenic. Sand and gravel and carbonate aquifers are more likely than the sandstone aquifers to exhibit arsenic-impaired ground water. The number of public water systems currently exceeding the arsenic MCL is significantly less than what is listed in Table M4-A because numerous public water systems have installed treatment to remove arsenic since 2006. The elevated arsenic results collected from 2005 to 2006 and beyond (while treatment processes were installed and refined) are included in the ten years of data used to generate the public water system decadal averages. These elevated values increase the decadal mean calculated for Table M4-A and thus, result in impaired systems on a decadal mean, but these systems are currently serving water below the Arsenic MCL. Figure M-4 illustrates the distribution of the public water systems with arsenic in treated and/or raw water greater than the MCL as listed in Table M-4A.

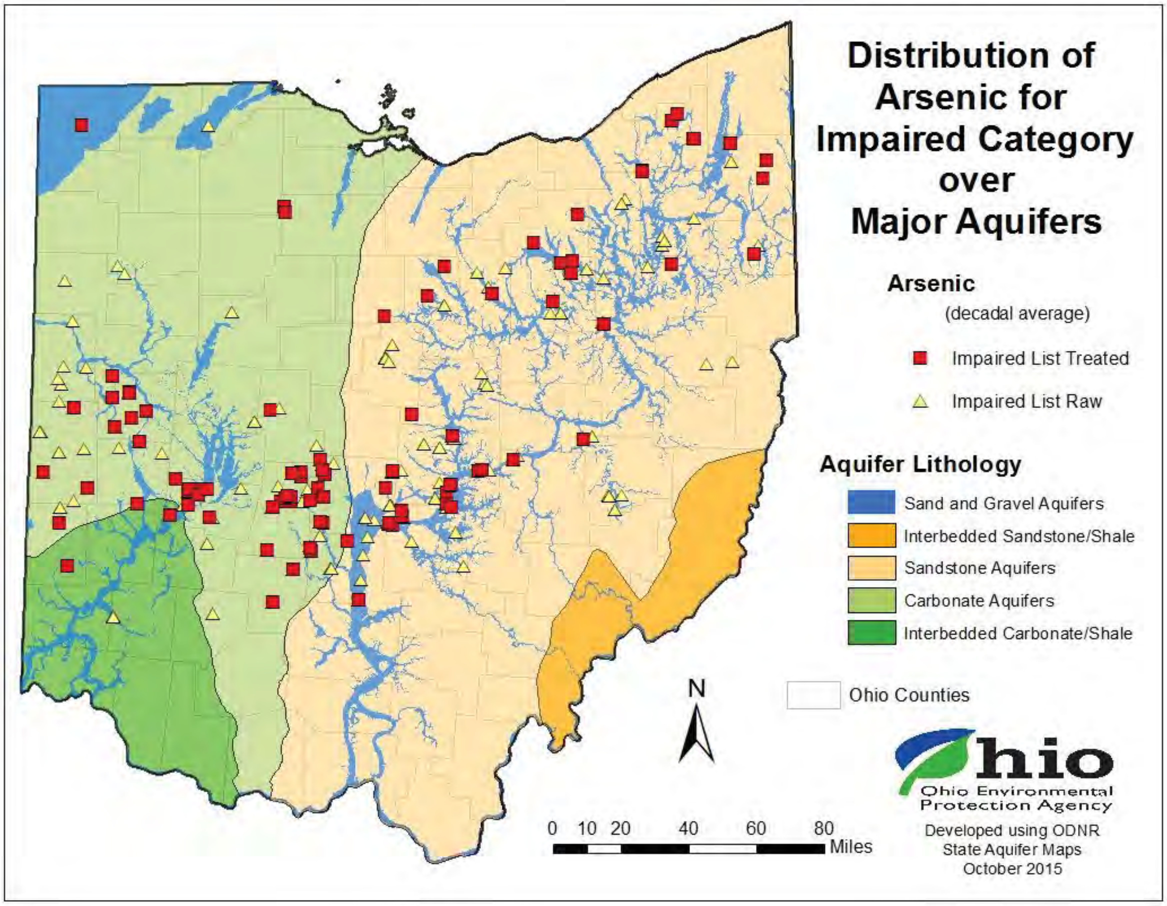


Figure M-4. Distribution of public water systems on impaired list for arsenic for both treated and raw waters.

SMCL Parameters

Secondary MCL parameters for drinking water are directed at non-health related issues such as taste and odor. public water systems do not collect compliance data for most parameters with SMCLs. Table M-4A utilized only compliance data and, consequently, it includes little data for treated water for parameters with SMCLs. The raw water data collected through new well samples, however, provides information on the distribution of these parameters.

Multiple public water systems display elevated **chloride**. The largest numbers of public water systems with elevated chloride are associated with the sandstone aquifers followed by sand and gravel aquifers and carbonate aquifers. This may be related to limited natural oil and gas deposits occurring within aquifers, contamination of local aquifers from surface handling of oil and gas production brines, local salt storage facilities overlying sensitive aquifers, road salt application, or septic systems. Transportation routes are concentrated in the broad, flat buried valleys and consequently, large salt piles are stored on these broad valleys, which are sensitive aquifers. Activities to address chloride contamination are discussed in the Major Sources of Ground Water Contamination section.

Iron and manganese, have similar oxidation-reduction solubility controls as arsenic and widespread distribution and thus exhibit elevated numbers of public water systems in the watch list and impaired category of Table M-4A for raw water. Table M-4A utilized only compliance data so little data for treated water is included for iron and manganese. The raw water concentration for Fe and Mn are controlled by the increased solubility of iron

and manganese in reduced waters. The deeper wells generally exhibit more reduced conditions (e.g., reduced interaction with the atmosphere) and, consequently, elevated iron and manganese. Iron is a common element and is present in all three major aquifers. For manganese, the carbonate aquifer is least likely to exhibit concentrations above the SMCL. Many public water systems remove iron and manganese, so the percentage of public water systems that exhibit impairments in treated water is significantly lower than in raw water.

Sulfate also has an SMCL and only raw water data exists for identifying water quality impacts. A significant number of public water systems exhibit elevated sulfate in the both the watch and impaired categories as illustrated in Figure M-5. Although these sites are distributed in all major aquifers, the carbonate aquifers in NW Ohio exhibit the highest percentage of public water systems on the watch list and in the impaired category (44 percent of carbonate vs. 10-12 percent for sandstone and sand and gravel) due to the presence of evaporates (Gypsum, $CaSO_4 \cdot 2H_2O$) in the Salina Formation in northwest Ohio.

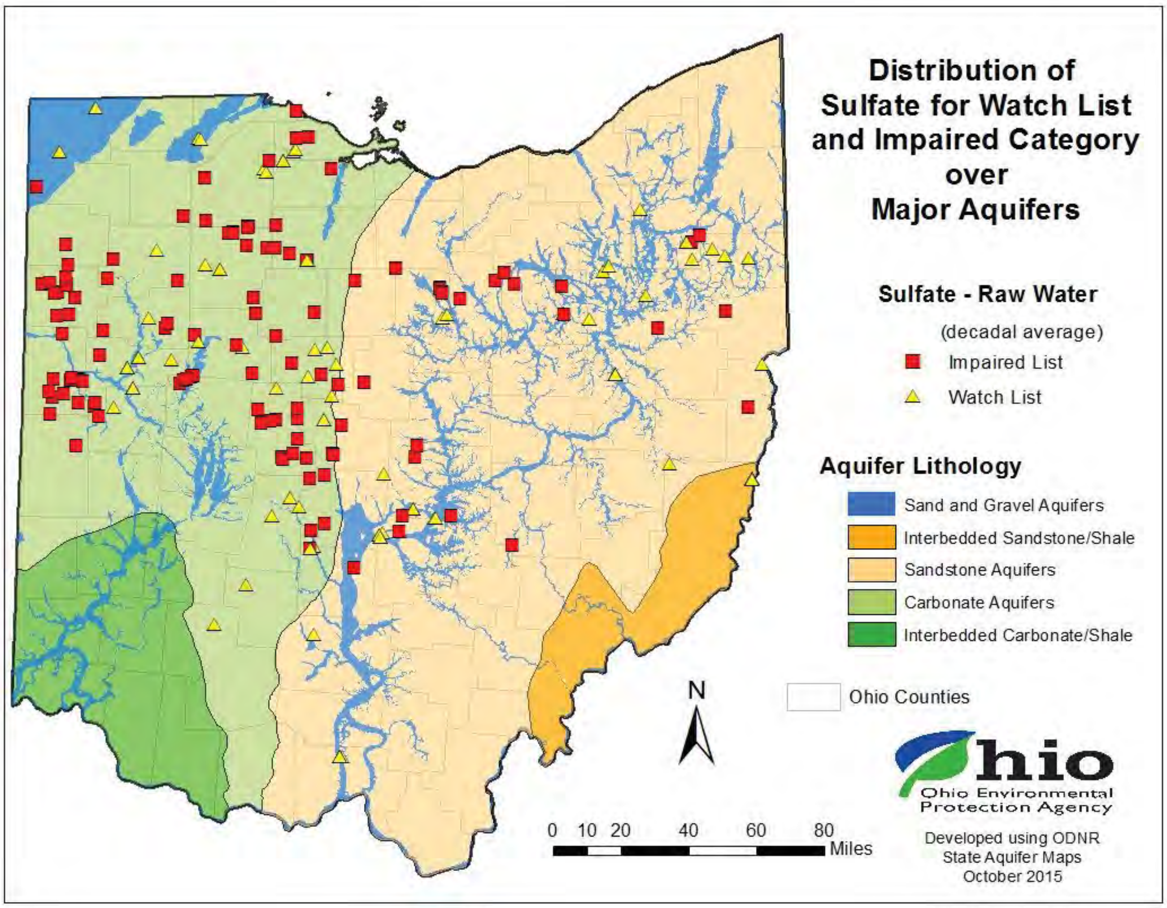


Figure M-5. Distribution of public water systems in impaired category and on the watch list for sulfate in raw water.

Fluoride has no public water systems in the impaired category for raw or treated water, however, a number of public water systems exhibit watch list concentrations in treated and raw water. Fluoride is unusual in that it has a primary and secondary MCL and the SMCL is 50 percent of the MCl. Thus, all of the systems on the watch list for the MCL exceed the SMCL. The distribution of the fluoride watch list systems for both raw and treated water are plotted in Figure M-6. The Fluoride Technical Report (2012) describes how fluorite, which was deposited as a secondary mineral in fractures in the carbonate aquifers, controls the distribution of elevated fluoride.

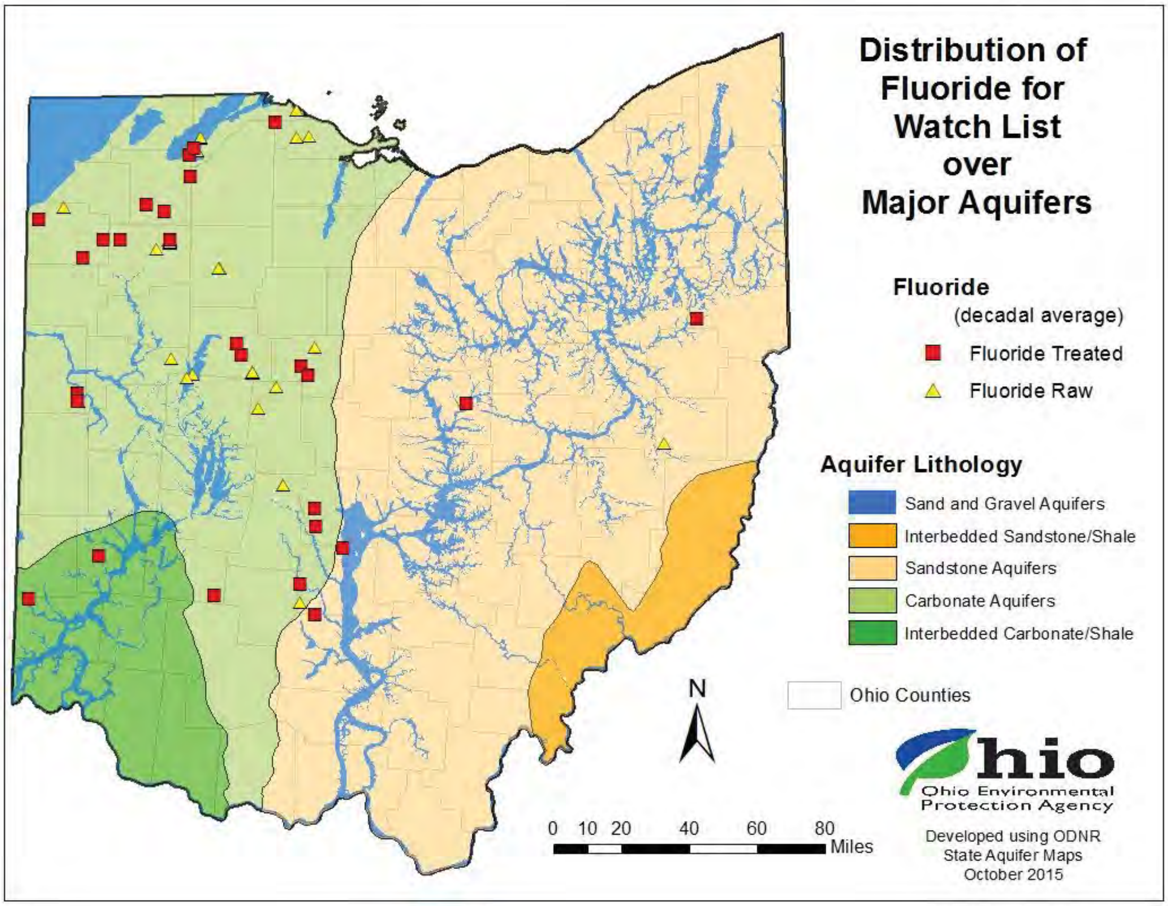


Figure M-6. Distribution of public water systems on fluoride MCL watch list for treated and raw water.

For **nitrate and nitrite,** maximum values were used rather than average values to reflect the acute nature of the nitrogen MCLs. As a parameter that is stable in oxidized environments, nitrate is more likely to be present in shallower wells. Approximately 2.9 percent (149 of 5074) of public water systems in Table M-4A (treated water) have maximum nitrate greater than 50 percent of the MCL. Approximately 50 percent of these public water systems are located in sand and gravel aquifer settings. A public water system that exceeds 50 percent of the nitrate MCL is required to sample for nitrate on a quarterly basis. Thus, over the last decade, at least 150 public water systems have been required to increase nitrate sampling to at least quarterly. For nitrate in treated water and raw water, 24 and 22 public water systems fall into the impaired category, respectively. public water systems with maximum results greater than the MCL do not necessarily indicate an MCL exceedance, which is an annual average.

public water systems with elevated nitrate tend to be associated with more sensitive aquifers such as buried valleys and areas of thin glacial drift over bedrock. Stable nitrate (where decadal averages are relatively high) tend to be found in systems that combine a shallow aquifer with rapid pathways between surface and ground water and stable oxic or sub-oxic ground water. The number of public water systems with maximum nitrates in treated water in the watch list or impaired categories has decreased since 2010 based on the 2010 (243 public water systems), 2012 (227 public water systems), 2014 (181 public water systems) and 2016 (149 public water systems) Integrated Reports. This is encouraging, but probably reflects improved treatment or use of alternative sources, rather than reduction in nitrate loading. Figure M-7 illustrates the distribution of the public water systems with maximum nitrate above the MCL for both raw and treated water. The public water systems in Figure M-7 tend to cluster along buried valley aquifers, but some occur in bedrock aquifers below thin till or overburden.

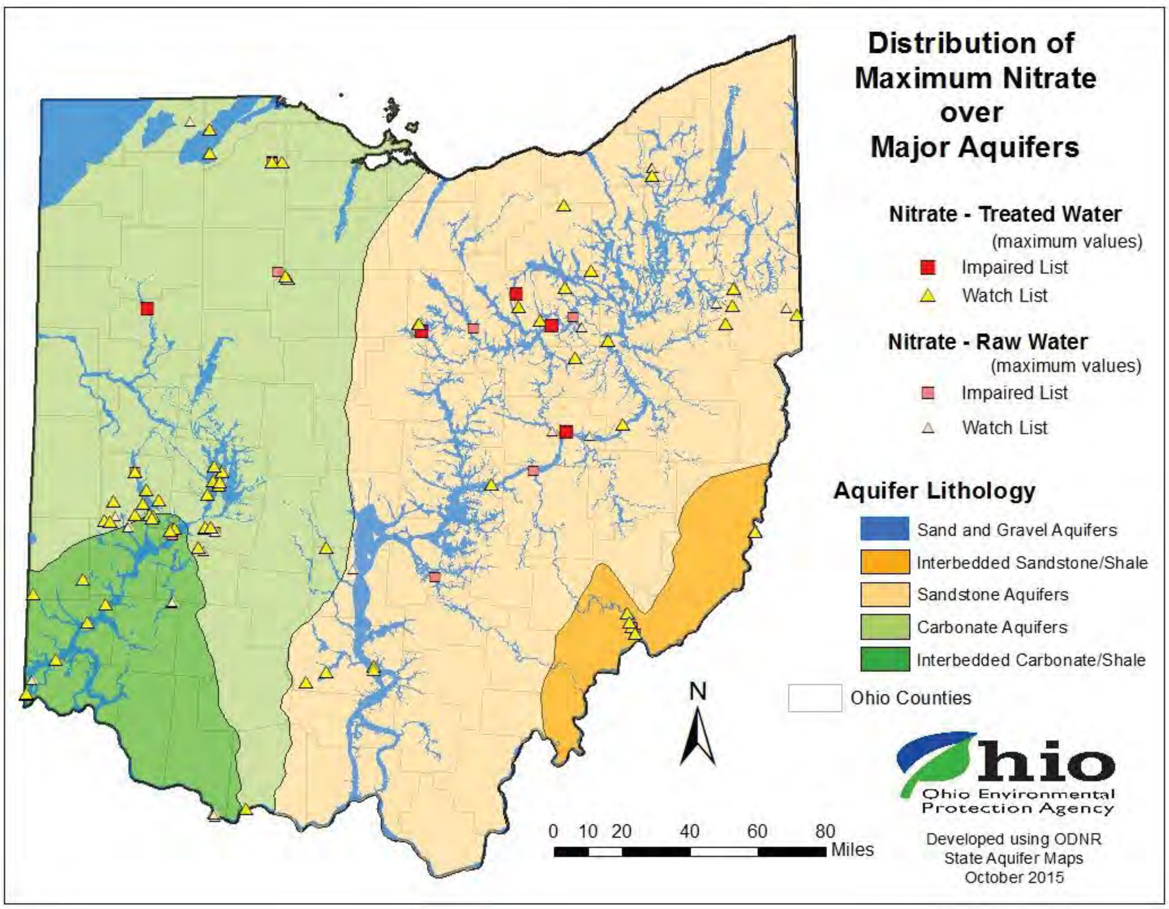


Figure M-7. Distribution of public water systems with maximum nitrate in treated and raw water greater than the MCL.

Organic Parameters

For the organic parameters, the mean concentration of treated water samples for six organic parameters has placed public water systems in the impaired category: **1,2-dichloroethane, 1,1-dichlorethylene, 1, 2-dichloropropane, dichloromethane, tetrachloroethylene and vinyl chloride.** Two of these parameters are common solvents and the third is a compound used to make plastic. Dichloromethane (methylene chloride) is a known lab contaminant, but it is also possible that it can leach to ground water before it volatilizes, so it is included in Table M-4A. In addition to the public water systems identified above, there are about 15 public water systems that are not using a production well or are using air strippers to remove VOC contamination

from ground water prior to use. The raw water data may include some of these systems, but if these ground water-based public water systems were not removing VOC contaminants, additional constituents would be identified as impaired.

Pesticides and Synthetic Organics

One pesticide and synthetic constituent is identified as impaired, **di(2-ethylhexyl)phthalate.** These data confirm that although we see impact from pesticides and other organic compounds migrating to major aquifers, the protection that the till cover and tile drainage provide to protect Ohio ground water is significant.

Radiological Parameters

For treated water, several public water systems are included on the watch list and the impaired category for **gross alpha** and **radium 228**. The limited number of public water systems in the watch list and impaired category is consistent with the Ohio's geologic setting having few natural sources of radionuclides. The exceptions are uranium associated with reduced geologic settings like glacial tills, the Ohio Shale and coal deposits, but these settings are generally not utilized as aquifers. Gross beta compliance monitoring focuses on anthropogenic sources of radiation. The distribution of radionuclides is discussed in the DDAGW technical report *Radionuclides in Ohio's Ground Water* (July 2015).

Ambient Ground Water Quality Monitoring Data

Mean values were calculated from the AGWQMP data (raw water) for each well over the past ten years (2005 through 2014) to determine the number of wells in the watch list and impaired categories for each constituent. These numbers are listed in Table M-4B by parameter and major aquifer. The number of wells used in the determinations is also presented to provide the relative number of wells that exhibit ground water quality with elevated concentrations of MCL parameters. A limited number of AGWMP wells are listed in the watch list and impaired category, as was the case for the public water system compliance data. The results for groups of parameters are discussed below.

Inorganic Parameters

The AGWQMP does not collect data for **antimony (except for one sandstone well), asbestos, beryllium, cyanide, mercury, nitrite, silver and thallium**, so no comparison can be made to the public water system data. These parameters are not analyzed due to their historically low concentrations in Ohio ground water. No well waters are impaired (have decadal averages that exceed the MCL or SMCL) for **barium, cadmium, chromium, fluoride, selenium and zinc**. Several wells exceed 50 percent of the fluoride MCL. These wells produce water from the carbonate aquifer, as was seen with public water systems in Table M-4A and Figure M-6. A few well means are greater than 50 percent of the **barium** MCL, but as stated above, no impairments were identified. Averages for **chloride** exceed the SMCL in a few cases. Ten wells have chloride above 50 percent of the SMCL and an additional three wells exceed the SMCL. The source of contamination is likely associated with improper storage of salt for road deicing, oil and gas drilling brine disposal, brines in bedrock aquifers with a history of oil production, or road deicing.

Table M-4B. Counts of wells where 2003-2013 decadal mean values of AGWQMP data occur in the Watch List and Impaired Category (maximum values used for nitrate).

Chemical Group	Chemical	Standard Type	Standard	Major Aquifer	Ambient GW Quality Wells		
					Raw Water		
					Total # Wells	Watch List > 50% to 100% MCL	Impaired > MCL
Inorganic Parameters	Antimony	MCL	6 µg/L	Sand and Gravel	nda	nda	nda
				Sandstone	1		
				Carbonate	nda	nda	nda
	Arsenic	MCL	10 µg/L	Sand and Gravel	165	23	26
				Sandstone	40	3	
				Carbonate	57	8	6
	Barium	MCL	2 mg/L	Sand and Gravel	165	2	
				Sandstone	40	1	
				Carbonate	57		
	Cadmium	MCL	5 µg/L	Sand and Gravel	165		
				Sandstone	40		
				Carbonate	57		
	Chloride	SMCL	250 mg/L	Sand and Gravel	165	7	1
				Sandstone	40	2	1
				Carbonate	57	1	1
	Chromium	MCL	0.1 mg/L	Sand and Gravel	165		
				Sandstone	40		
				Carbonate	57		
	Fluoride	MCL	4 mg/L	Sand and Gravel	165		
				Sandstone	40		
				Carbonate	57	5	
	Iron	SMCL	0.3 mg/L	Sand and Gravel	165	11	116
				Sandstone	40	1	29
				Carbonate	57	7	44
	Manganese	SMCL	0.05 mg/L	Sand and Gravel	165	23	116
				Sandstone	40	3	28
				Carbonate	57	15	9
	Nitrate * (max values)	MCL	10 mg/L	Sand and Gravel	165	11	1
				Sandstone	40	1	
				Carbonate	57	2	
	Selenium	MCL	50 µg/L	Sand and Gravel	165		
				Sandstone	40		
				Carbonate	57		
	Solids, Total Dissolved	SMCL	500 mg/L	Sand and Gravel	165	109	55
				Sandstone	40	24	11
				Carbonate	57	4	53
	Sulfate	SMCL	250 mg/L	Sand and Gravel	165	16	2
				Sandstone	40	2	2
				Carbonate	57	10	23

Chemical Group	Chemical	Standard Type	Standard	Major Aquifer	Ambient GW Quality Wells		
					Raw Water		
					Total # Wells	Watch List > 50% to 100% MCL	Impaired > MCL
	Zinc	SMCL	5.0 mg/L	Sand and Gravel	165		
				Sandstone	40		
				Carbonate	57		
Volatile Organic Chemicals	1,2-Dichloro-ethane	MCL	5 µg/L	Sand and Gravel	160		
				Sandstone	38		
				Carbonate	57		
	1,1-Dichloro-ethylene	MCL	7 µg/L	Sand and Gravel	160		
				Sandstone	38		
				Carbonate	57		
	1,2-Dichloro-propane	MCL	5 µg/L	Sand and Gravel	160		
				Sandstone	38		
				Carbonate	57		
	Benzene	MCL	5 µg/L	Sand and Gravel	160		
				Sandstone	38		
				Carbonate	57		
	Carbon Tetrachloride	MCL	5 µg/L	Sand and Gravel	160		
				Sandstone	38		
				Carbonate	57		
	Cis-1,2-Di-chloroethylene	MCL	70 µg/L	Sand and Gravel	160		
				Sandstone	38		
				Carbonate	57		
	Dichloro- methane	MCL	5 µg/L	Sand and Gravel	160		
				Sandstone	38		
				Carbonate	57	1	
	Styrene	MCL	0.1 mg/L	Sand and Gravel	160		
				Sandstone	38		
				Carbonate	57		
	Tetrachloro-ethylene	MCL	5 µg/L	Sand and Gravel	160		
				Sandstone	38		
				Carbonate	57		
	Trichloro-ethylene	MCL	5 µg/L	Sand and Gravel	160		
				Sandstone	38		
				Carbonate	57		1
	Vinyl Chloride	SMCL	2 µg/L	Sand and Gravel	160	4	1
				Sandstone	38		
				Carbonate	57		
Pesticides	Alachor	MCL	2 µg/L	Sand and Gravel	16		
				Sandstone	2		
				Carbonate	2		
	Atrazine	MCL	3 µg/L	Sand and Gravel	16		
				Sandstone	2		
				Carbonate	2		

Chemical Group	Chemical	Standard Type	Standard	Major Aquifer	Ambient GW Quality Wells		
					Raw Water		
					Total # Wells	Watch List > 50% to 100% MCL	Impaired > MCL
	Simazine	MCL	4 µg/L	Sand and Gravel	16		
				Sandstone	2		
				Carbonate	2		

Blank spaces indicate no wells exceed the standards (zeros left out to emphasize impacted wells).
"nda" indicates no data available
* Numbers for nitrate and nitrite are based on maximum values to reflect the acute nature of contaminant.
** MCL is for combined Radium 226 and Radium 228

For **nitrate**, well maximums were used rather than averages to reflect the acute nature of the nitrate MCL. This approach makes it difficult to compare the nitrate numbers to numbers for other parameters in Table M-4B. Nitrate is stable in oxidized environments and, thus, is more likely to be detected in shallower wells that have rapid exchange pathways with the atmosphere and surface water. In the AGWQMP, the sand and gravel wells are generally the shallowest and consequently, would be expected to exhibit the largest number of wells with elevated nitrate concentrations. This is the case with about seven percent of the sand and gravel wells exceeding 50 percent of the MCL. Four percent of the carbonate wells exceed 50 percent of the MCL, probably associated with sensitive karst settings and only two and-one-half percent of the sandstone wells are on the watch list for (maximum) nitrate. The AGWQMP tends to collect samples from higher production wells located deeper in aquifers; consequently, it is not the best program to evaluate ground water quality in shallow (e.g., 25 to 50 feet), sensitive aquifer settings.

Arsenic, iron, manganese, total dissolved solids (TDS) and sulfate mean concentrations result in significant numbers of wells on the watch list and in the impaired category. These are the same parameters identified in the public water system compliance data, with the addition of TDS. TDS is not required or collected for public water systems compliance data. Except for arsenic, all of these parameters have SMCLs and treatment is generally not required. Many public water systems remove iron, with the additional benefit of manganese and arsenic removal, since arsenic and iron solubility are controlled by similar redox controls. Sulfate in the AGWQMP is elevated in carbonate aquifers due primarily to the presence of evaporates in the Salina Formation, in the upper portion of the Silurian carbonate aquifer. For the carbonate aquifers, 58 percent of the ambient sites exceed 50 percent of the SMCL for sulfate, which is significantly higher than the percentage of sandstone and sand and gravel aquifers (10 percent and 4.5 percent respectively). The elevated TDS in raw water results from the relative solubility of aquifer material and the residence time for ground water in all of Ohio's major aquifers. The carbonate aquifers generally have higher mean TDS, but all three main aquifers exhibit high percentages of ambient sites with TDS exceeding 50 percent of the SMCL.

Organic Parameters - Detection of organic parameters at and above watch list concentrations is not common in the AGWQMP. Detected organic parameters above the MCL include dichloromethane, trichloroethylene and vinyl chloride. These organic solvents were detected in public water systems raw water samples as listed in Table M-4A.

Pesticides – No pesticides were detected in the AGWQMP wells above 50 percent of the MCL. The AGWQMP does not analyze for pesticides on a regular basis, as reflected in the low number of wells listed for pesticides, due to the lack of pesticide detections during several sampling rounds in the late 1990s. This sampling and consultations with the Ohio Department of Agriculture regarding its pesticide sampling results,

suggests that further pesticide data collection is not cost-effective for the AGWQMP. Review of available data supports the conclusion that the glacial till provides protection for Ohio's ground waters based on low detections rates and low concentrations detected. Nevertheless, local sensitivity and improper use of pesticides can lead to pesticide impacts. The historic data points to the greatest impacts occurring at the mixing sites or areas of spills.

Radiological Parameters – Radiological parameters are not included in the AGWQMP sampling.

Comparison of Public Water System and AGWQMP Data

Overall, we see similar trends in the public water system compliance and the AGWQMP data. This confirms that the AGWQMP data are appropriate for identifying long-term trends in the ground water quality of the major aquifers utilized by the public water systems. Thus, the AGWQMP goal of monitoring and characterizing the ground water quality utilized by public water systems in Ohio is validated by these empirical data.

It is interesting that the ground water quality differences documented between the major aquifers in AGWQMP data based on major components are not obvious in Tables M-4A and M-4B. The major elements or components (Ca, Mg, Cl, Na, K, sulfate and alkalinity) are generally the parameters utilized to identify water types. However, Ca, Mg, K and alkalinity do not have MCLs or SMCLs, so MCL and SMCL comparisons are limited in their capacity to delineate geochemical differences among waters from different aquifers. Chloride and sulfate do have SMCLs and exhibit significant differences between the major aquifers as noted above in Tables M-4A and M-4B. Treatment, such as softening, of public water system-distributed water can mask differences in water quality between major aquifers.

The most recognizable geochemical differences between the major aquifers in Ohio relate to the concentrations of calcium, magnesium, bicarbonate and strontium. These differences relate to the higher solubility of carbonate rocks and the long water-rock reaction time of ground water. The carbonate waters are characterized by elevated calcium, manganese, bicarbonate and strontium compared to water in sandstone and sand and gravel aquifers. The higher percentages of public water systems that exhibit watch list and impaired category results for TDS and sulfate in the carbonate aquifers reflects the dissolution of gypsum within the carbonate stratigraphy. Summary data from the AGWQMP provides a description of Ohio's major aquifers and their water quality and are presented in the technical report, *Major Aquifers in Ohio and Associated Water Quality (2015)*, which is included as Appendix A to this chapter.

M7. Ground Water-Surface Water Interaction

DDAGW special studies generally focus on water quality impacts in ground water associated with recharge in sensitive geologic settings. Thus, special studies provide information on the ground water- surface water (GW-SW) interaction related to surface water recharge and contaminants transported with recharge. Two technical reports completed in 2014-2015 and ongoing projects document elements of the GW-SW interaction. Brief summaries of these studies are provided below.

The technical report *Reduction-Oxidation (Redox) Control in Ohio's Ground Water Quality (2014)* describes the control redox conditions have on several common water quality parameters, such as nitrate, manganese, iron and sulfate. This document describes how microbes mediate electron transfer reactions and promotes understanding of redox as it relates to water quality. This document provides tools for anyone reviewing ground water quality data to identify the relative position of the aquifer in the redox range from oxic to methanogenic, if selected parameters are analyzed. The oxic portion occurs at the surface of the water table

and is controlled by oxygen exchange with the atmosphere and/or the migration of oxidized surface water recharge to the aquifer. The Hydrogeologic Sensitivity Assessment (HSA) procedure developed for the Ground Water Rule uses redox conditions as an indicator of the time of travel for surface recharge to reach the production aquifer. If E. coli is found in aquifers with reducing conditions, it is interpreted to indicate that rapid recharge pathways are present. Since *E.coli* is not well adapted to the vadose and aquifer environments, it is unlikely to survive long enough to make the trip from the surface unless hydrogeologic barriers are short circuited, allowing rapid migration of surface recharge to the production aquifer. Thus, the HSA utilizes indications of rapid recharge to evaluate sensitivity of local aquifers to pathogen migration.

The draft *Strontium in Ohio's Ground Water* technical report documented the elevated strontium associated with the carbonate aquifers as described in section M-3 and illustrated in Figure M-3. The Unregulated Contaminant Monitoring Rule 3 data show that multiple public water systems using surface water exhibit elevated strontium. This is attributed to the influence of baseflow during low flow conditions and documents the direct link between ground water and surface water. Figure M-8 illustrates the relationship between strontium and discharge in the Sandusky River at the Fremont gauging station. The influence of elevated strontium in ground water can cause problems for facilities requesting discharge permits. These examples document why we need to maintain the efforts to integrate ground water and surface water.

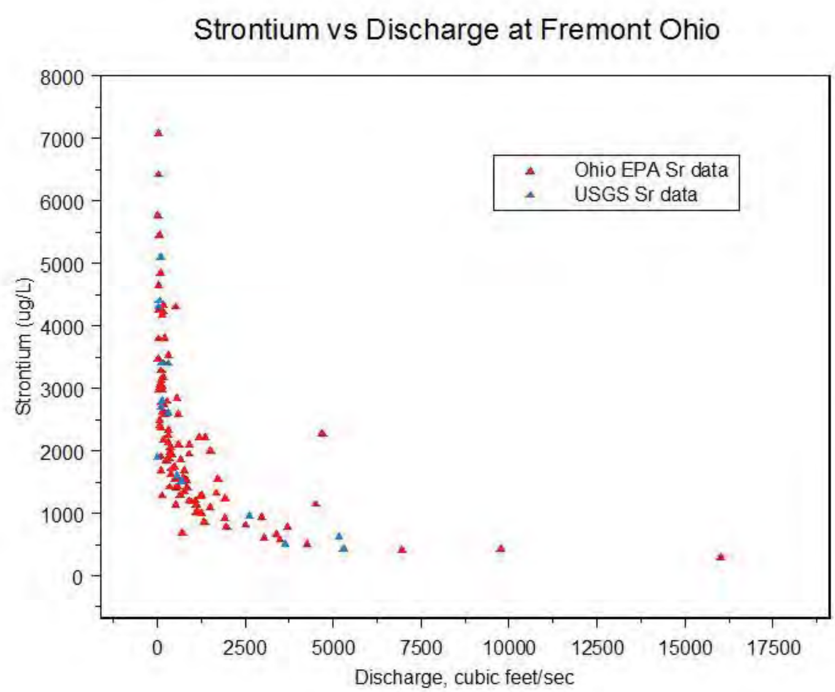


Figure M-8. Strontium in surface water in the Sandusky River at Fremont

The Division of Drinking and Ground Waters continues to sample three ODNR observation wells selected for ground water quality monitoring in conjunction with the water level data collected by ODNR. The purpose is to evaluate correlations between static water level and water quality at a high sampling density. Samples have been collected monthly since June 2012 and, starting in May 2014, the sampling was shifted to quarterly. Starting in July 2014, samples to characterize the microbial community structure, function and activity and to identify microbial signatures of metal release in ground water, were collected by Dr. M. Wilkins and graduate students at The Ohio State University. Preliminary results will be evaluated in 2016.

M8. Conclusions and Future Directions for Ground Water Protection

Ohio is fortunate that ground water is plentiful across the state. With the exceptions of a few areas that exhibit effects of over-pumping, decreasing static water levels have not been documented across extensive areas. Some new, high-yielding agricultural wells are being installed, but the duration of pumping is generally limited, so annual recharge appears to replenish the aquifer. Although the quantity of ground water appears stable, the documentation of water quality impacts in this document illustrate that continued protection of ground water resources is necessary. Ground water contamination can eliminate the potential use of water resources, just like diminished quantities. If other water sources are not available, additional treatment will increase the cost of providing a needed resource.

As documented in the previous sections, numerous sites exhibit ground water contamination from anthropogenic and natural point and nonpoint sources. The alternative to combat natural sources of contamination that cause impairment of drinking water is to develop and install treatment that removes the contamination or to locate another water source. The options for managing anthropogenic sources are more numerous, with the most constructive focusing on prevention of releases that migrate to ground water. Instituting best management practices (especially for the use of fertilizers and salt storage), implementing appropriate siting criteria for new waste storage and disposal sites and improving design for material storage and waste disposal facilities are proactive approaches to prevent releases to ground water. These kinds of proactive practices are critical to the sustainability of Ohio's high quality ground water resources.

The ongoing implementation of the Source Water Protection Program (SWAP) for Ohio's public water systems helps raise awareness of ground water quality issues and promotes source water protection planning. The SWAP potential contaminant source inventory data was instrumental in identifying and ranking major sources of contamination near public water systems, as listed in Table M-3 in the 2012, 2014 and 2016 Integrated Reports. SWAP staff has also had key roles in the development of several guidance documents to help protect ground water in association with the SCCGW.

Generally, awareness and concern about ground water resources is increasing. State agencies are working together to develop appropriate guidance or guidelines for activities that may threaten ground water. This is documented by the development of the *Recommendations for Geothermal Heating and Cooling Systems* (February 2012) and *Recommendations for Salt Storage* (February 2013). The most recent guidance is the updated *Regulations and Technical Guidance for Sealing Unused Water Wells and Boreholes*, finalized in March 2015. ODNR, in conjunction with several other agencies, has revised and developed fact sheets and best management practices to provide information on water resource issues associated with shale gas development. These documents are available on the ODNR Division of Oil & Gas Resources Web Page in the Shale activity section: http://oilandgas.ohiodnr.gov/shale#SHALE

To help provide well owners information on water quality, Ohio EPA worked with ODH and OSU Extension on the development of a new Web-based water quality interpretation tool for private well owners. In the "Know Your Well" tool, water sample results from a lab sheet are entered into the tool and with one click, well owners are provided with the standard for the parameter of interest, the natural range in ground water in Ohio for comparison, recommendations on actions, health effects and treatment options if applicable. The tool is part of this website hosted at OSU Extension at: http://ohiowatersheds.osu.edu/know-your-well-water

In 2013, a new relational database, GWQCP, was completed for DDAGW. This database houses water quality data for non-compliance projects in DDAGW. The completion of reports for pulling data from the database, user's guides and updates of the Operating Procedures Document were completed in 2014, with final

review in 2015. Thus, the database and documentation are now in place. Other activities completed over the past two years include:

- A discussion of future directions for the GW Characterization Program
- Extended sampling interval for geochemically stable wells
- Addition of new sandstone and carbonate wells

The Ambient Ground Water Quality Monitoring Program continues to collect high quality raw water data. The long-term nature of these data, dating back to the 1960's for some wells, allows evaluation of long-term ground water time series, which are extremely valuable for appraising the sustainability of the resource. These data from active public water system production wells place a priority on collecting water quality data to evaluate and characterize the ground water resource that is utilized. The GWQCP staff works to use ground water quality data to support and direct activities of the DDAGW as well as to provide these data to the public and other programs.

With the new database and documentation in place, the current focus of the Ground Water Characterization Program is to analyze the data and to increase the availability of these data to the public. The main approach to accomplish this will be to continue to generate the technical reports and fact sheets, with reports on iron & manganese, nitrate, chloride and barium to be completed next year. This effort will continue to document the value of the AGWQMP data. Other goals for the AGWQMP are to work to include the wells in the National Ground Water Monitoring Network, include methane in the parameter list and continue to anticipate future water quality needs.

Ohio's ground water resources are relatively well-protected from surface contamination due to the layer of low-permeability glacial till that overlies approximately two-thirds of the state. Long-term efforts to protect ground water quality need to focus on aquifers subject to rapid recharge from the surface, such as shallow fractured bedrock, karst bedrock and shallow sand and gravel units.

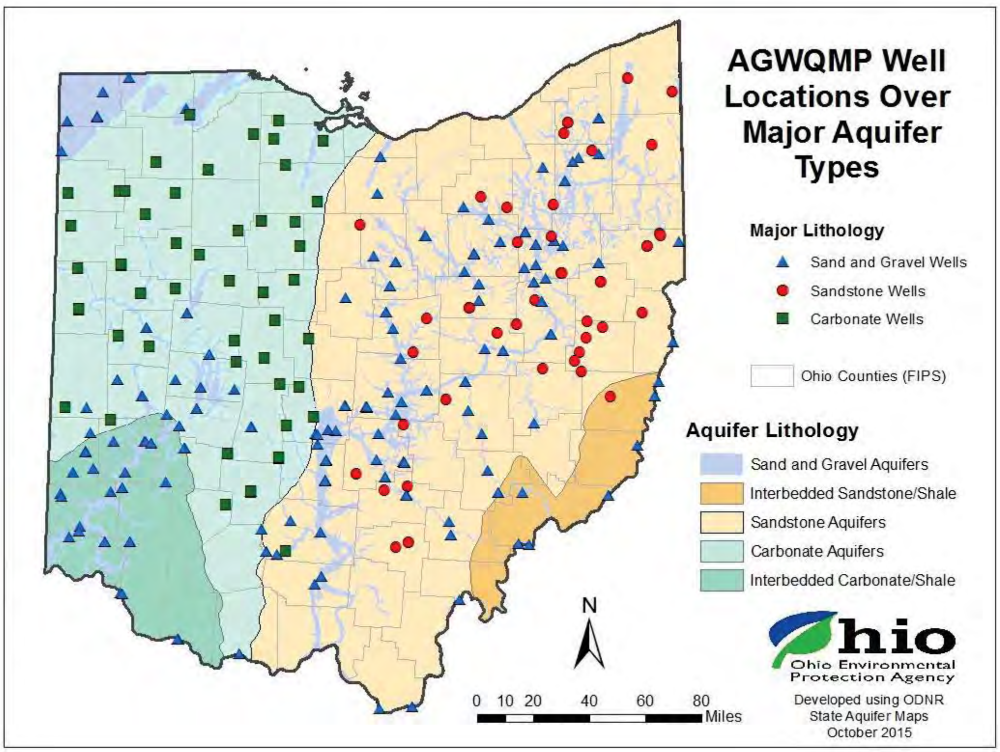
Ground Water Section Appendix

Appendix A – Major Aquifers in Ohio and Associated Water Quality

This technical report provides a description of Ohio's major aquifers and their distribution. The water quality of these aquifers is described by providing mean, median, minimum and maximum values for all AGWQMP (raw water) data from active wells by aquifer type. Well means are also presented as boxplots for individual constituents, in the report appendix. This provides a visual representation of the variability of parameters within and between the major aquifer types.

Ohio Environmental Protection Agency

Major Aquifers in Ohio and Associated Water Quality



Division of Drinking and Ground Waters
Technical Series on Ground Water Quality
October 2015

The Technical Series on Ground Water Quality:

This series of reports provides information to the professional/technical community about ground water quality in Ohio's aquifers. These reports use data from:

- the ambient ground water quality monitoring program; and
- the public water system compliance programs.

These data, representative of raw water, are used to characterize the distribution of selected parameters in ground water across Ohio. The goal is to provide water quality information from the major aquifers, exhibit areas with elevated concentrations, and identify geologic and geochemical controls. This information is useful for assessing local ground water quality, water resource planning, and evaluating areas where specific water treatment may be necessary.

A series of parallel fact sheets, targeted for the general public, provide basic information on the distribution of the selected parameters in ground water. The information in the fact sheets is presented in a less technical format, addresses health effects, outlines treatment options and provides links to additional information.

Disclaimer
The Ohio EPA, Division of Drinking and Ground Waters (DDAGW) is providing information in this technical series as a public service. While Ohio EPA believes this information to be reliable and accurate, some data may be subject to human, mechanical or analytical error. Therefore, Ohio EPA does not warrant or guarantee the accuracy of these data. Because of the variability inherent in ground water data, caution must be taken in extrapolating point-data beyond the collection site. The accuracy, completeness, suitability and conclusions drawn from the information presented here are the sole responsibility of the user.

Technical Series
Major Aquifers in Ohio and Associated Water Quality

Abstract

The major aquifers are described and ground water quality data is presented that characterizes them. The data presented provides ranges of constituent concentrations typical of the major aquifers across Ohio. These data are representative of source water utilized by public water systems (raw or untreated water). These data are not pristine, since a number of the AGWQMP wells are impacted by elevated chloride, nitrate and organic parameters sourced from surface activities. The inherent variability in ground water means care must be taken when extrapolating point data beyond the collection site. However, the information compiled in this report is the best summary available for the general water quality of Ohio's major aquifers, and is presented to help evaluate water quality in local aquifers.

Introduction

The purpose of this report is to:

- Summarize information on Ohio's major aquifers;
- Discuss factors that influence the water quality within aquifer types; and
- Present water quality data representative of the major aquifers.

This information is intended to help evaluate local water quality by providing ranges of parameter concentrations typical of Ohio's major aquifers for comparison. The water quality data presented has been collected by Ohio EPA's Ambient Ground Water Quality Monitoring Program (AGWQMP) and is representative of raw or untreated water.

Ohio's Major Aquifers

Ohio has abundant surface and ground water resources. Average precipitation ranges between 30 to 44 inches a year (increasing from northwest to southeast), which drives healthy stream flows. Infiltration of a small portion of this precipitation (3-16 inches) recharges the aquifers and keeps the streams flowing.

Ohio's aquifers can be divided into three major types as illustrated in Figure 1 (modified from ODNR Statewide Aquifer Maps, 2000). The sand and gravel buried valley aquifers (in blue) are distributed as thin bands through the state. The valleys filled by these sands and gravels are cut into sandstone and shale in the eastern half of the state (in tans) and into carbonate aquifers (in greens) in the western half. The sandstone and carbonate aquifers generally provide sufficient production for water wells except where dominated by shale, as in southwest and southeast Ohio.

Sand and Gravel Aquifers

The unconsolidated sand and gravel units, typically associated with buried valley aquifers, are Ohio's most productive water-bearing formations. These valleys were cut into the bedrock by pre-glacial and glacial streams and were subsequently back-filled with deposits of sand, gravel and other glacial drift by glacial and alluvial processes as the glaciers advanced and receded. Buried valley aquifers are found beneath and adjacent to the Ohio River, its major tributaries, and other pre-glacial stream channels such as the Teays River.

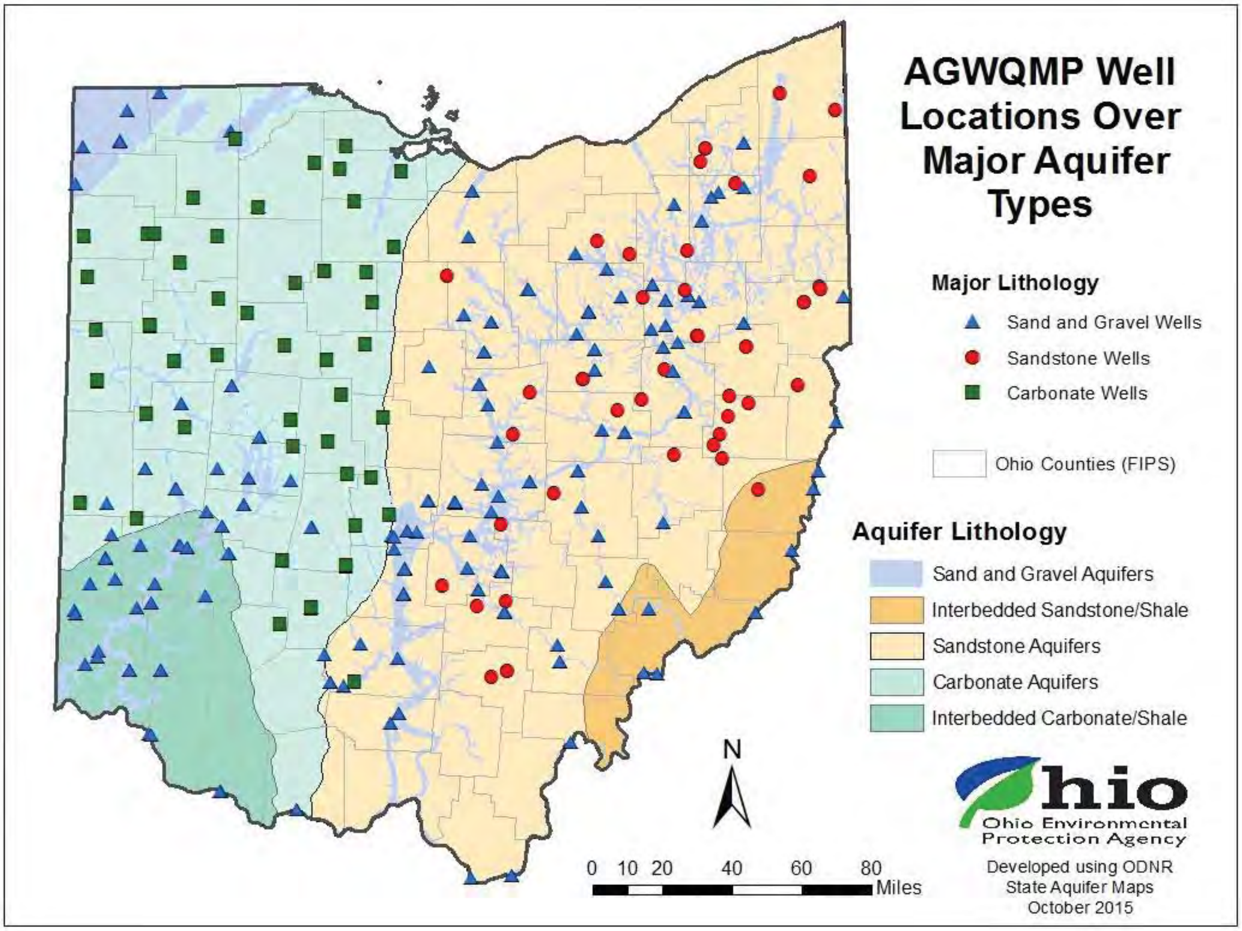


Figure 1. Aquifer Types in Ohio modified from ODNR Glacial and Bedrock Aquifer Maps.

In addition to the buried valley aquifers, lenses of sand and sand and gravel within glacial tills may be productive, although generally providing lower yields than the buried valley aquifers. Outwash/kame and beach ridge deposits are also important sand and gravel aquifers in local areas. Several other types of extensive sand and gravel aquifers are included in Figure 1. In the northwest corner of the state, the triangular area of sand and gravel units bordering Michigan and Indiana includes sheets of outwash or sand and gravel that occur between sheets of glacial till. The large patches of sand and gravel just east of the triangular outwash deposits are reworked delta deposits of the Oak Opening Sands. Present day stream processes deposit alluvial sand and gravel deposits that also serve as aquifers if the alluvial deposits are thick enough.

Water production from the coarser-grained and thicker sand and gravel deposits ranges up to 500 to 1,000 gallons per minute (gpm). However, lower yields from sand and gravel aquifers are more common. The production depends on the type, distribution, permeability, and thickness of aquifer materials and well construction parameters, such as borehole diameter, screen length, and development. Yields of these unconsolidated aquifers are illustrated on the ODNR web site at:
http://water.ohiodnr.gov/maps/statewide-aquifer-maps
in the Example Maps created from SAMP Data section.

Sandstone Aquifers

In eastern Ohio, Mississippian and Pennsylvanian sandstones and conglomerates are the dominant bedrock aquifers (Figure 1). Sandstone and conglomerate units of variable thickness and areal extent are interbedded with numerous layers of siltstone and shale with minor amounts of limestone, clay, and coal. The sandstones generally dip a few degrees to the southeast, toward the Appalachian Basin. Some of the thicker sandstones and conglomerates can yield 50 to 100 gpm, but 25 gpm is good for these aquifers. The more productive stratigraphic units include:

- **Pennsylvanian Sharon through Massillon Formations, and the Homewood Sandstone within the Pottsville and Allegheny Groups** - These sandstones, including some conglomerates, were deposited on a stable coastal plain with rising sea level. These aquifers are most commonly used in the northern areas of eastern Ohio. To the southeast, farther into the Appalachian Basin, the water is generally too saline for drinking.

- **Mississippian Berea Sandstone, Cuyahoga Group, Logan and Blackhand Formations** - These siltstones and sandstones with minor conglomerate were sorted and deposited in deltaic complexes from material eroded from the Acadian Mountains (Late Devonian uplift) to the east. These units also extend to the southeast, farther into the Appalachian Basin, but as with the Pennsylvanian units, the water becomes too saline for drinking.

In southeastern Ohio, Upper Pennsylvanian and Permian stratigraphic sections include low-yielding aquifers. The bedrock consists of varied sequences of thin-bedded shales, limestones, sandstones, clays, and coals of the Pennsylvania Conemaugh and Monongahela Groups and the Permian Dunkard Group. Yields below five gpm are common in these areas as illustrated in Figure 2 (from the ODNR web page at: http://water.ohiodnr.gov/maps/statewide-aquifer-maps in the Example Maps Created from SAMP Data section.

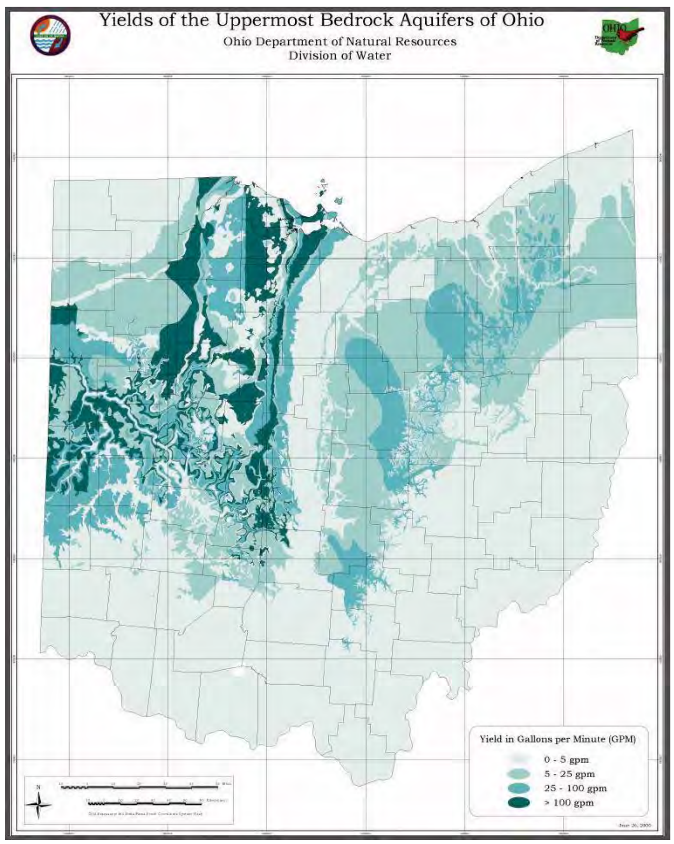


Figure 2. Typical yields for bedrock aquifers.

Carbonate Aquifers

Carbonate bedrock is the dominant aquifer in western Ohio (Figure 1). Silurian and Middle Devonian limestone and dolomite reach a total thickness of 300 to 600 feet, and are capable of yielding from 100 to over 500 gpm. Higher production units are associated with fractures and dissolution features that increase the permeability. The high production aquifers, in order of deposition, are fractured or karst Silurian sub-Lockport/ Lockport Dolomite and equivalent units, the Salina Group, consisting of the Tymochtee and Greenfield Dolomites, and

the Undifferentiated Salina Dolomite and equivalent evaporites. The Devonian Columbus and Delaware Limestones, exposed along the eastern edge of the Silurian Dolomites, and equivalent Devonian units in the northwest corner of Ohio (Detroit River Group, Dundee Limestone, Silica Formation, and Ten Mile Creek Dolomite) are productive carbonate aquifers. These carbonates were generally deposited in warm, shallow seas with limited input of sediment from continental sources. Where the Devonian limestone is overlain by 100 feet or more of Devonian shale, the water quality is poor and generally cannot be considered a drinking water source.

Southwestern Ohio is underlain by inter-bedded lower Ordovician carbonates and shales. These units are dominated by shale (Figure 1). As a result, well yields are generally less than 10 gpm, and in many areas, are less than one gpm (Figure 2). Consequently, in southwestern Ohio (as in southeastern Ohio), public water systems depend on the buried valley aquifers as the main ground water source. These low yielding aquifers are only practical for low volume use. Ohio EPA has little water quality data from shale-dominated wells, and consequently, they are not discussed further in this report. Another area with low yields is the region of Devonian shale that overlies the Columbus and Delaware Limestone aquifers. The narrow north-south trending area of Devonian shale in central Ohio is clearly illustrated in Figure 2 as the area of low yields (0-5 GPM) that separates the carbonate aquifers in the west from the sandstone aquifers to the east. Where the north trend of the shales meets Lake Erie, the shale curves eastward along the Lake Erie shoreline as illustrated in Figure 2 by the band of low yields there. In addition, to the low yield, hydrogen sulfide is frequently present, which causes water quality problems.

Ground Water Quality by Aquifer Type

General Considerations

The overall ground water quality in Ohio is described here using the Ambient Ground Water Quality Monitoring Program (AGWQMP) database, which consists of approximately 6,000 inorganic and 2,600 organic water quality samples distributed across 282 active wells. Figure 1 illustrates the distribution and aquifer type of AGWQMP wells. As described above, the major aquifers include unconsolidated sand and gravel units deposited on sandstone bedrock in eastern Ohio and carbonate bedrock in western Ohio. The majority of the wells used in this characterization are public water supply production wells, usually developed within higher yielding zones with good water quality. This effort supports the goals of the AGWQMP - to collect, analyze, and describe the source (ambient) ground water quality used by public water systems across the state.

AGWQMP data are presented by major aquifer type. Water-rock interaction along flow paths imparts distinct geochemical signatures which are reflected in the ground water quality. Several factors contribute to the chemical makeup of ground water; the most significant are the composition of the recharge (percolation) water, the soil and vadose zone composition, the composition of the aquifer solids, and the residence time of the ground water. These factors vary widely across the three main aquifers types in Ohio, but some broad observations are possible. In general, the initial composition of percolation water across the state is similar. Long-term average precipitation for Ohio is 38 inches per year, while ground water recharge rate estimates range from 3 inches to 16 inches per year, with a median of 6 inches per year (Dumochelle and Schiefer, 2002). Composition and solubility of soil and vadose materials vary, however, leading to recharge waters with variable initial compositions. The thick glacial tills (clayey soils) found across much of north, central, and west Ohio affect the initial percolation water quality differently than the weathered colluvium with variable amounts of loess in southeast Ohio. The permeability of the heavy glacial soils tends to increase the residence time; however, agriculture tile drains in many of these glacial soils can short circuit flow paths to surface water and thus, reduce the

volume of recharge reaching local aquifers.

Increased residence time in an aquifer typically leads to higher salinity and greater mineralization of the water, depending on the solubility of the aquifer minerals present. Sand and gravel aquifers, for example, commonly have short residence times, leading to lower salinity. These younger waters are generally shallower, and are more likely to be affected by contamination from land use activities. Older, deeper waters, such as found in the carbonate aquifers of northwestern Ohio, may follow much longer flow paths, allowing the water ample time to establish a geochemical equilibrium with the rock system. Figure 3 is a box plot indicating the distribution of well depths by aquifer type for the AGWQMP wells. The median depth in the carbonate aquifers (~225 feet) is slightly greater than the median depth in the sandstone aquifers (~220 feet). The median depth for the sand and gravel aquifers (~ 90 feet) is less than one-half the depth of the carbonate or sandstone aquifers, suggesting shorter residence times for sand and gravel aquifers compared to bedrock aquifers.

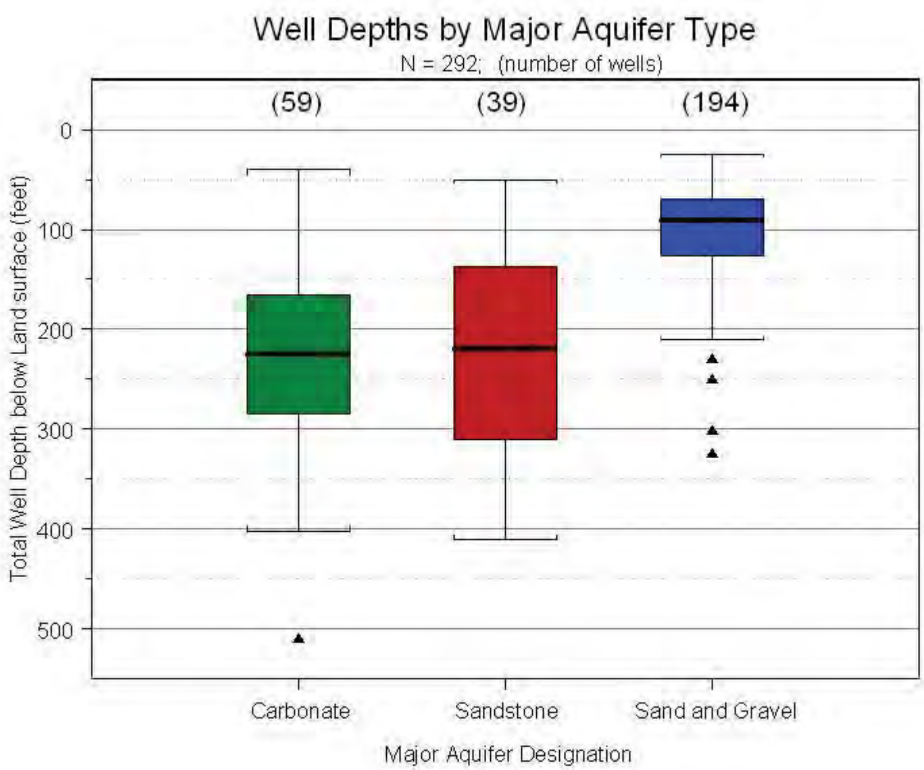


Figure 3. Box plot of active AGWQMP well depths by aquifer type.

Inorganic Parameter Mean Values

Ambient ground water quality data presented in Table 1 (starting on page 10) summarize the geochemistry by major aquifer type for all active AGWQMP wells. This table provides the arithmetic mean, median, minimum value, maximum value, standard deviation, total number of samples, number of samples below the reporting limit, and the percent non-detect for all individual inorganic and field

parameter results in each aquifer type as of July 2015. Brief descriptions of several of these parameters are provided to aid in understanding the data. For instance, the reporting limit was used for the non-detect values in calculating means and standard deviation. The "non-detect" column records the percent of analyses with results below the reporting limit (rounded to the nearest percent). The presence of a less than sign (<) in the minimum value field (column 5) indicates the minimum value is the reporting limit. The minimum value may not coincide with the current reporting limit due to changes in analytical methods. AGWQMP sampling started in 1973, and changes in analytical methods resulted in multiple reporting limits for some constituents. The estimates of the number and percentages of non-detect data (columns 8 and 9) may also be influenced by changes in the reporting limits.

Table 1 summarizes the accumulation of over 164,000 raw, inorganic ground-water data results gathered at 282 active and standby wells across Ohio over 40 years of sampling. Consistent sampling protocol, analytical procedures, and long site histories lend a unique significance to these data. Table 1 is the best summary available for the general water quality of Ohio's major aquifers, which provides the source water for Ohio's public drinking water systems using ground water. Note, however, that some wells in the AGWQMP network have been influenced by anthropogenic sources, such as nitrates or VOCs. Thus, the water quality presented is not pristine, but rather is typical of the ground water quality of aquifers utilized for source water by the public water systems.

The data listed in Table 1 is organized into four categories:

- **Field Parameters** – measured in the field, such as pH and water temperature;
- **Major Constituents** – such as calcium or sulfate; concentrations in the range of mg/L;
- **Trace Constituents** – such as arsenic or cadmium; concentrations in range of µg/L; and
- **Nutrients** – components required by organic systems for growth; concentrations in mg/L.

The statistical parameters in Table 1 were generated using individual sample result values. This is complemented by a graphical summary using box and whisker plot diagrams based on means for each well in Appendix A. In Appendix A box plots, the inorganic results are plotted on the Y-axis, while the X-axis represent the three major aquifer groupings (sand and gravel, sandstone, and carbonate).

Use of Primary and Secondary MCLs

Maximum Contaminant Levels (MCLs) are health-based regulatory standards for permissible concentrations of constituents in drinking water delivered to the public. Secondary Maximum Contaminant Levels (SMCLs) are advisory limits applied to distribution water at public water systems for aesthetic water quality issues, such as taste and odor. Because AGWQMP data are obtained from raw (untreated) ground water, which is unregulated, any exceedance of an MCL or SMCL by an AGWQMP data point has no legal or regulatory consequence for the public water system. However, since MCLs and SMCLs are widely known, they represent a practical benchmark for discussion. MCLs and SMCLs are included in the first column of Table 1 and included on the boxplots in Appendix A for constituents that have established regulatory values.

Seven of the primary constituents for which health based MCLs exist are monitored in raw water through the AGWQMP. These are arsenic (10 µg/L), barium (2 mg/L), cadmium (5 µg/L), chromium (100 µg/L), fluoride (4 mg/L), nitrate-nitrite as N (10 mg/L), and selenium (50 µg/L). Additionally, copper and lead have action levels (not MCLs or SMCLs) of 1.3 mg/L and 0.015 mg/L respectively. As indicated by the

Ambient Ground Water Quality Table 1, no constituent exceeds a MCL based on averages by aquifer type. Arsenic exhibits the highest concentrations as a percentage of the MCL; nevertheless, mean concentrations for all three aquifer types are well below the arsenic MCL of 10 µg/L (sand and gravel = 5.41 µg/L, sandstone = 2.48 µg/L, carbonate = 3.75 µg/L). However, 30 active AGWQMP wells have raw water means that exceed the arsenic MCL of 10 µg/L. If these wells are public water system wells, treatment would be required to bring arsenic concentrations below the MCL in the distributed water. Means for barium, cadmium, chromium, fluoride, nitrate-nitrite, and selenium are also below MCLs within all three aquifer systems. Individual well means indicate no MCL exceedances for barium, cadmium, chromium, fluoride, nitrate, and selenium, but three AGWQMP wells have barium means greater than 75 % of the MCL.

Nine constituents with established SMCLs are monitored by the AGWQMP. These are: aluminum (0.05 - 0.2 mg/L), chloride (250 mg/L), fluoride (2.0 mg/L), iron (0.3 mg/L), manganese (0.05 mg/L), pH (7-10.5 SU), sulfate (250 mg/L), total dissolved solids (TDS, 500 mg/L), and zinc (5 mg/L). The SMCL levels are exceeded by the aquifer means for several of these constituents as exhibited in Table 1, and by individual well means in Appendix 1.

Volatile Organic Compounds

Volatile organic compounds (VOCs) have been monitored in untreated water for the AGWQMP since the mid-1980s with a standard sampling frequency of 18 months. A reporting level of 0.5 µg/L (ppb) has been used consistently. Fortunately, the detection rate for VOCs is low, about 0.29 percent (506 detections from 172,077 results), but their presence usually indicates water quality impact from land use activities. AGWQMP sampling protocols may increase the sampling frequency if VOCs are detected; currently, 15 active AGWQMP wells are sampled for organics every six months to help evaluate potential for migration of VOC plumes into public water system wells. The higher VOC sampling frequency of wells with VOC detections increases the detection rates. In some cases, wells with VOC detections are abandoned by public water systems and are no longer available for sampling by the AGWQMP.

The five VOCs representative of point source origins that exhibit the highest rate of detections in active AGWQMP wells are listed in Table 2. The parameter name, the number of detections, the number of sites with detections, and the range of detections are listed below.

Table 2. Most Frequently Detected VOCs in AGWQMP Wells.

Parameter	Number of detections	Number of sites with detections	Range of results (µg/L)	Maximum Contaminant Level (MCL)
Trichlorloroethylene	68	8	0.5-44.2	5
cis-1,2-Dichloroethylene	59	11	0.5-4.92	70
ıloroethylene	53	6	0.5-28.5	5
Methyl tertiary butyl ether (MTBE)	33	4	0.5-6.73	none
1,1,1,Trichloroethane	11	2	0.5-1.39	5

Chlorinated solvents are the primary chemical group in Table 1. These include trichloroethylene (TCE), cis-1,2-dichloroethylene, tetrachloroethylene (PCE), and 1,1,1-trichloroethane (1,1,1- TCA). These solvents were developed over the last century as cheaper and more practical alternatives to petroleum solvents. PCE and TCE have been in industrial use over 60 years. PCE is widely used for dry cleaning. PCE and TCE can both undergo dechlorination (loss of a chlorine) leading to the daughter products 1,1-dichloroethylene, cis- and trans-1,2-dichloroethylene, which ultimately degrade into vinyl chloride. As a group, their concentrations in ground water are quite low, well below MCLs, but maximum values for TCE (14 results at one site) and PCE (2 of 53 results) are above MCL. The usage of multiple solvents or the degradation of one solvent to another can explain the occurrence of mixtures of these compounds found in some AGWQMP wells. MTBE, a gasoline additive (oxygenate), is also included in the top five list, but 29 of the 33 detections occur at one well and concentrations are generally decreasing in this well.

Most of the wells with VOC impact are associated with sensitive aquifers, which is not surprising considering the point source nature of most VOC sources. From a practical standpoint, most detections of VOCs should be considered water quality impacts, as there are few natural sources of these man-made chemicals. There are, of course, exceptions to this generalization, such as benzene from crude petroleum in aquifers known for oil production down dip or in associated stratigraphic units. The limited detection data and anthropogenic association of these organic compounds make them of little use in characterizing water quality, beyond the fact that their presence usually indicates water quality impacts from land use activities.

Trihalomethanes (THM) are the most frequently detected organic compounds in AGWQMP wells (119 detections at 33 sites), including chloroform, bromoform, dichlorobromomethane, and chlorodi-bromomethane. However, the source of these compounds is not always clear. The maximum value detected in active wells, 37 µg/L, is well below the MCL of 80 µg/L. Thrihalomethanes are a byproduct of disinfection using chlorine, and are not uncommon in public water system distribution water. Thus, if there is backflow from the distribution system to the AGWQMP sample location (leaking foot valve or poor sample tap location), or if the well has been disinfected recently, THMs may be present. A third possibility is that treated water from lawn watering or leaks in the distribution system or sewer lines is recharging local wells. The source of THMs in a well is not always clear, consequently, unlike the VOC detections, THM detections cannot always be attributed to land use impacts.

Summary

The major aquifers are described and water quality data is presented that characterizes them. The data presented provides ranges of constituent concentrations typical of the major aquifers across Ohio. These data are representative of source water utilized by public water systems (raw or untreated water). These data are not pristine, since a number of the AGWQMP wells are impacted by elevated chloride, nitrate and organic parameters sourced from surface activities. The inherent variability in ground water means care must be taken when extrapolating point data beyond the collection site. However, the information compiled in this report is the best summary available for the general water quality of Ohio's major aquifers, and is presented to help evaluate water quality in local aquifers.

References Cited

Dumouchelle, D., and M.C. Schiefer, 2002. Use of Streamflow Records and Basin Characteristics to Estimate Ground-Water Recharge Rates in Ohio. Ohio Department of Natural Resources Division of Water. Columbus Ohio. Bulletin 46.

Ohio Department of Natural Resources (ODNR), 2000. Statewide Aquifer Mapping Project 1997-2000 (Unconsolidated and Consolidated); web link: http://soilandwater.ohiodnr.gov/maps/statewide-aquifer-maps

Table 1 – Ambient Ground Water Quality Data

Ambient Ground Water Quality Monitoring Data Summary for Results from Active Wells by Major Aquifer as of July 2015

FIELD PARAMETERS

MCL/ SMCL	Parameter and Units	Major Aquifer	Mean Value	Median Value	Minimum Value *	Maximum Value	Standard Deviation	Number of Samples	Number § Below Rep. Limit	Percent § Non-detect
	Oxidation-Reduction Potential (ORP) mV	Sand and Gravel	56.9	32	-520	815	129	1675	NA	NA
		Sandstone	105	69	-530	902	210	372	NA	NA
		Carbonate	-25.0	-22	-301	799	143	402	NA	NA
7.0-10.5 S.U.	pH, Field S.U.	Sand and Gravel	7.32	7.33	5.6	8.6	0.33	3471	NA	NA
		Sandstone	7.24	7.24	5.67	8.7	0.46	668	NA	NA
		Carbonate	7.21	7.19	5.22	8.7	0.31	967	NA	NA
	Specific Conductivity µmohms/cm	Sand and Gravel	692	680	120	2375	202	3414	NA	NA
		Sandstone	634	533	68	3420	318	654	NA	NA
		Carbonate	930	880	270	3030	291	960	NA	NA
500 S mg/L	Total Dissolved Solids, Field mg/L	Sand and Gravel	531	517	187	1726	141	1622	NA	NA
		Sandstone	477	382	44	2605	256	371	NA	NA
		Carbonate	745	697	293	2170	206	404	NA	NA
	Water Temperature Degrees C	Sand and Gravel	13.4	13.1	3.3	31.9	2.11	3427	NA	NA
		Sandstone	12.5	12.3	6.4	18.8	1.4	654	NA	NA
		Carbonate	13.2	12.9	6.9	19	1.6	955	NA	NA

MAJOR COMPONENTS

MCL/ SMCL	Parameter and Units	Major Aquifer	Mean Value	Median Value	Minimum Value * £	Maximum Value	Standard Deviation	Number of Samples	Number Below Rep. Limit	Percent Non-detect
	Alkalinity, Total as $CaCO_3$ mg/L	Sand and Gravel	257	265	5	587	66.2	4002	7	0
		Sandstone	205	196	33.1	496	74.9	776	0	0
		Carbonate	295	306	92.6	642	67.4	1049	0	0
	Calcium, Total mg/L	Sand and Gravel	92.8	93	<2.0	300	23.7	4065	1	0
		Sandstone	57.1	58	<2.0	167	26.7	781	3	0
		Carbonate	123	114	26	584	39.6	1063	0	0
250 S mg/L	Chloride mg/L	Sand and Gravel	40.6	32	<2.0	474	34	4046	130	3
		Sandstone	54	31.9	<2.0	899	74.5	778	49	6
		Carbonate	28.1	16	<2.0	420	34.9	1045	101	10
	Hardness, Total as $CaCO_3$ mg/L	Sand and Gravel	347	352	<10.0	953	83.9	3524	2	0
		Sandstone	213	214	<10.0	541	86.4	702	1	0
		Carbonate	505	450	110	2060	165	935	0	0
	Magnesium, Total mg/L	Sand and Gravel	28.2	29	<1.0	81	9.42	4066	9	0
		Sandstone	16.5	16	<1.0	35	6.97	781	5	1
		Carbonate	49.8	43	11	147	18.4	1063	0	0
	Potassium, Total mg/L	Sand and Gravel	2.41	2.0	<0.9	20	1.04	3925	984	25
		Sandstone	2.34	2.0	<1.0	6.5	0.76	771	264	34
		Carbonate	2.82	2.1	<1.3	11.6	1.2	1035	109	11
	Sodium, Total mg/L	Sand and Gravel	26.4	22	<4.0	427	20.2	4069	107	3
		Sandstone	60.1	28	<5.0	754	73.6	781	26	3
		Carbonate	35.5	28	<5.0	239	26.6	1062	19	2
250 S mg/L	Sulfate mg/L	Sand and Gravel	74.4	64.7	<5.0	640	44	4052	29	1
		Sandstone	52.4	41.7	<5.0	271	48.8	782	83	11
		Carbonate	245	176	<5.0	1830	207	1065	3	0
500 S mg/L	Total Dissolved Solids mg/L	Sand and Gravel	457	448	<10.0	2120	116	3965	1	0
		Sandstone	391	332	48	1850	183	742	0	0
		Carbonate	722	638	264	3200	274	1035	0	0

TRACE CONSTITUENTS										
MCL/ SMCL	Parameter and Units	Major Aquifer	Mean Value	Median Value	Minimum Value * £	Maximum Value	Standard Deviation	Number of Samples	Number Below Rep. Limit	Percent Non-detect
50-200^S µg/L	Aluminum µg/L	Sand and Gravel	202	<200	<200	2880	55.7	3393	3385	100
		Sandstone	201	<200	<200	448	11.5	726	721	99
		Carbonate	208	<200	<200	2050	103.2	892	884	99
10 µg/L	Arsenic, Total µg/L	Sand and Gravel	5.41	<2.0	<2.0	102	8.42	3899	1992	51
		Sandstone	2.48	<2.0	<2.0	89.7	3.42	764	644	84
		Carbonate	3.75	<2.0	<2.0	30	3.66	1043	600	58
2000 µg/L	Barium µg/L	Sand and Gravel	154	116	<15.0	2160	175	3867	61	2
		Sandstone	237	78	<15.0	2120	421	753	72	10
		Carbonate	73.2	49	<7.0	568	68.0	1039	91	9
	Bromide µg/L	Sand and Gravel	82.6	58.2	<20	1680	98.7	1172	137	12
		Sandstone	156	44.8	<20	4080	341	270	31	11
		Carbonate	140	100	<20	920	157	289	91	31
5 µg/L	Cadmium, Total µg/L	Sand and Gravel	0.21	<0.2	<0.2	4.0	0.1	3652	3622	99
		Sandstone	0.23	<0.2	<0.2	18.8	0.67	765	756	99
		Carbonate	0..21	<0.2	<0.2	1.6	0.07	1022	1003	98
100 µg/L	Chromium, Total µg/L	Sand and Gravel	20.5	<30	<2.0	64	13.3	3707	3690	100
		Sandstone	19.7	<30	<2.0	30	13.5	771	770	100
		Carbonate	21.5	<30	<2.0	50	12.9	1025	1010	99
1300^AL µg/L	Copper µg/L	Sand and Gravel	11.3	<10	<2.0	758	26.9	3500	2496	71
		Sandstone	12.1	<10	<2.0	235	22.2	754	503	67
		Carbonate	15.7	<10	<2.0	586	44.4	918	583	64
4 mg/L 2^S mg/L	Fluoride mg/L	Sand and Gravel	0.39	0.24	<0. 02	2.71	0.36	3289	1053	32
		Sandstone	0.31	0.25	<0.1	1.28	0.17	713	161	23
		Carbonate	1.39	1.38	<0.1	3.58	0.62	879	24	3
300^S µg/L	Iron, Total µg/L	Sand and Gravel	1188	687	<20	58400	1576	4053	837	21
		Sandstone	1348	335	<50	31200	3237	779	187	24
		Carbonate	1095	814	<50	27300	1667	1066	110	10
15^AL µg/L	Lead, Total µg/L	Sand and Gravel	3.79	<2.0	<1.0	1590	33.6	3894	3568	92
		Sandstone	2.78	<2.0	<2.0	164	6.72	770	684	89
		Carbonate	3.11	<2.0	<2.0	167	8.08	1009	869	86

TRACE CONSTITUENTS										
MCL/ SMCL	Parameter and Units	Major Aquifer	Mean Value	Median Value	Minimum Value * £	Maximum Value	Standard Deviation	Number of Samples	Number Below Rep. Limit	Percent Non-detect
50 [S] µg/L	Manganese, Total µg/L	Sand and Gravel	195	121	<8.0	5130	230	3971	547	14
		Sandstone	225	89	<9.0	2220	358	774	146	19
		Carbonate	32	18	<10	300	33.8	1038	273	26
	Nickel, Total µg/L	Sand and Gravel	26.7	<40	<1.0	269	18.6	3460	2651	77
		Sandstone	26.4	<40	<2.0	175	19.4	734	634	86
		Carbonate	27.9	<40	<2.0	88	17.4	918	664	72
50 µg/L	Selenium, Total µg/L	Sand and Gravel	2.04	<2.00	<2.00	25	0.54	3536	3425	97
		Sandstone	2.05	<2.00	<2.00	17.7	0.62	758	735	97
		Carbonate	2.05	<2.00	<2.00	10	0.5	915	884	97
	Strontium, Total µg/L	Sand and Gravel	1894	366	<30	36400	4351	3455	5	0
		Sandstone	443	386	<30	1830	355	732	5	1
		Carbonate	16927	15300	<30	51600	11269	919	2	0
5000 [S] µg/L	Zinc, Total µg/L	Sand and Gravel	21.7	<10	<6.0	3340	90.9	3523	2413	68
		Sandstone	30.0	10	<10	902	63.3	752	352	47
		Carbonate	70.7	11	<10	4090	272	918	419	46

NUTRIENTS										
MCL/ SMCL	Parameter and Units	Major Aquifer	Mean Value	Median Value	Minimum Value * £	Maximum Value	Standard Deviation	Number of Samples	Number Below Rep. Limit	Percent Non-detect
	Ammonia mg/L	Sand and Gravel	0.21	0.07	0.1	3.41	0.35	4011	1675	42
		Sandstone	0.36	0.18	0.5	2.30	0.45	772	220	28
		Carbonate	0.41	0.35	0.5	5.93	0.47	1054	118	11
	Chemical Oxygen Demand mg/L	Sand and Gravel	13.7	<10	<2.0	200	9.27	3943	3624	92
		Sandstone	14.5	<10	<6.0	269	13.4	765	720	94
		Carbonate	14.9	<10	<10	371	15.4	1053	888	84
10 mg/L	Nitrite & Nitrate NO2 +NO3 as N mg/L	Sand and Gravel	0.77	<0.10	<0.09	12.3	1.29	3877	2089	54
		Sandstone	0.48	<0.10	<0.1	7.4	0.89	763	531	70
		Carbonate	0.38	<0.10	<0.1	15.1	1.02	1036	902	87
	Phosphorus mg/L	Sand and Gravel	0.08	<0.05	0.003	17.3	0.5	3668	2554	70
		Sandstone	0.09	0.05	0.01	4.4	0.26	725	341	47
		Carbonate	0.05	<0.05	0.01	4.37	0.16	976	647	66
	Total Kjeldahl N mg/L	Sand and Gravel	0.39	0.24	<0.08	6.75	0.40	2756	1153	42
		Sandstone	0.50	0.27	<0.2	3.82	0.51	609	241	40
		Carbonate	0.54	0.44	<0.2	7.04	0.54	731	141	19
	Total Organic Carbon mg/L	Sand and Gravel	2.44	<2.0	<0.5	75	3.07	3517	3176	90
		Sandstone	2.15	<2.0	<0.5	20	1.01	724	680	94
		Carbonate	2.51	<2.0	<2.0	73	4.12	778	820	88

* Records with ‘<’ represent reporting limit
§ NA denotes not applicable
£ Generally minimum values are current or historical reporting limits.
Historic reporting limits can be lower than current reporting limits.
S Secondary MCL
AL Action Level

Appendix A

Ambient Ground Water Quality Monitoring Program

Inorganic Constituent Box and Whisker Plots

This document provides a concise geochemical summary, in box and whisker plot format, of the Ambient Ground Water Quality Monitoring Program (AGWMP) inorganic data set as of July 2015. The Box and Whisker plots from the Ambient Ground Water Quality Network database include results from 6000 raw (untreated), inorganic water samples collected over the past 40 years across more than 200 active wells. Active (AGWMP) wells are sampled every six, eighteen or thirty-six months. The primary objective of collecting statewide, raw ground water data from major aquifers is to characterize Ohio's ground water quality, which in turn is used to enhance water resource planning and to prioritize ground water protection. The AGWMP places a priority on collecting water quality data representative of aquifers used by public water systems. Analysis of water quality changes in space and time indicate that some of the AGWMP wells are influenced by land use activities. The wells are considered typical of the local ground water used as source water for public water systems.

In the following box plots, the water-quality results are first averaged by well, then grouped by the three major aquifer types in Ohio to display the numerical data distributions. Water quality results are plotted on the y-axes, while the x-axes represent the three major aquifer categories (carbonate, sandstone, and sand and gravel). These box plots allow the reader to visually compare data variability across major aquifer types. The analyzed constituents are presented in the following order: Field Parameters; Major Constituents; Trace Constituents; and Nutrients. The number of wells used to construct each group's box plot is indicated above the x-axis.

The y-axis is presented in linear or in log 10 scale, whichever enhances readability. Box plots that appear without "boxes" (common in Trace Constituents section) have too little data variability to generate separation of the 25th and 75th percentiles of the distribution (upper and lower box bounds). In these cases, the boxes appear collapsed to the most common data point, typically the Reporting Limit. Collapsed boxes generally occur when more than 75% of the data are below the reporting limit. In the case of chromium and nickel, high reporting limits in early data distort the representation of variability of these data. In both of these cases, the lower (current) reporting limit was used for all non-detect results to more accurately represent the distribution of chromium and nickel.

Construction and interpretation details for a generic box plot are found on the next page of this report.

Ground Water Quality Characterization Program
Division of Drinking and Ground Waters
50 West Town Street, Suite 700
Columbus, OH 43215
(614) 644-2752
Web Page: http://www.epa.ohio.gov/ddagw/gwqcp.aspx
Email: gwq@epa.state.oh.us

Box and Whisker Plots

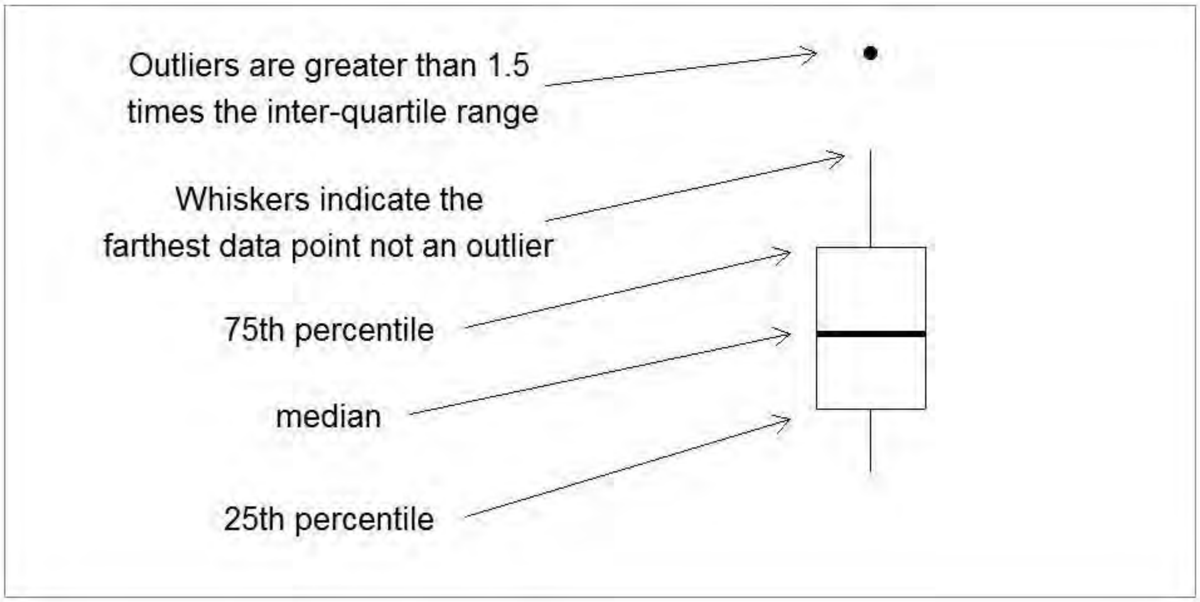


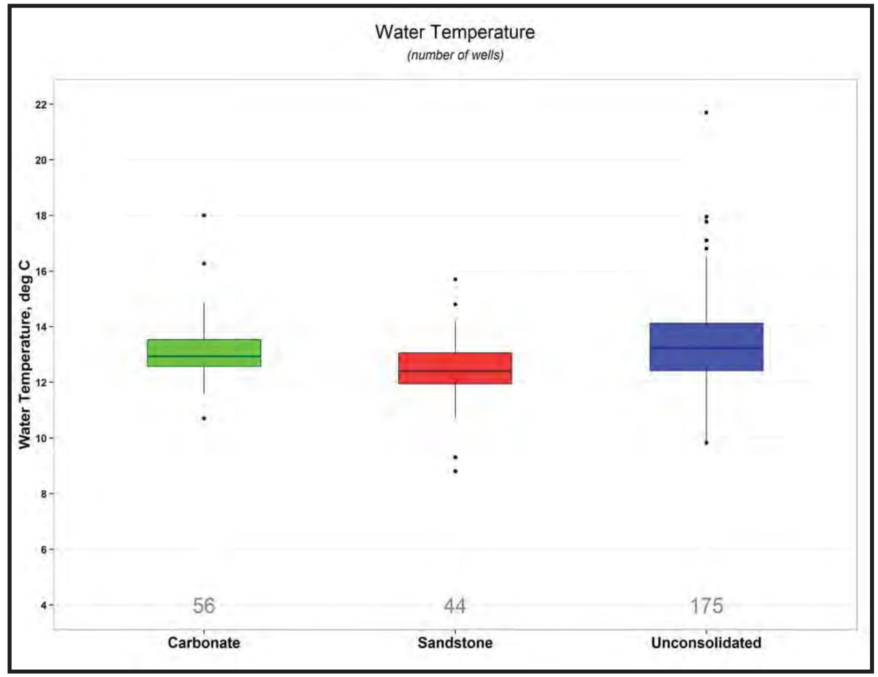
Figure 1

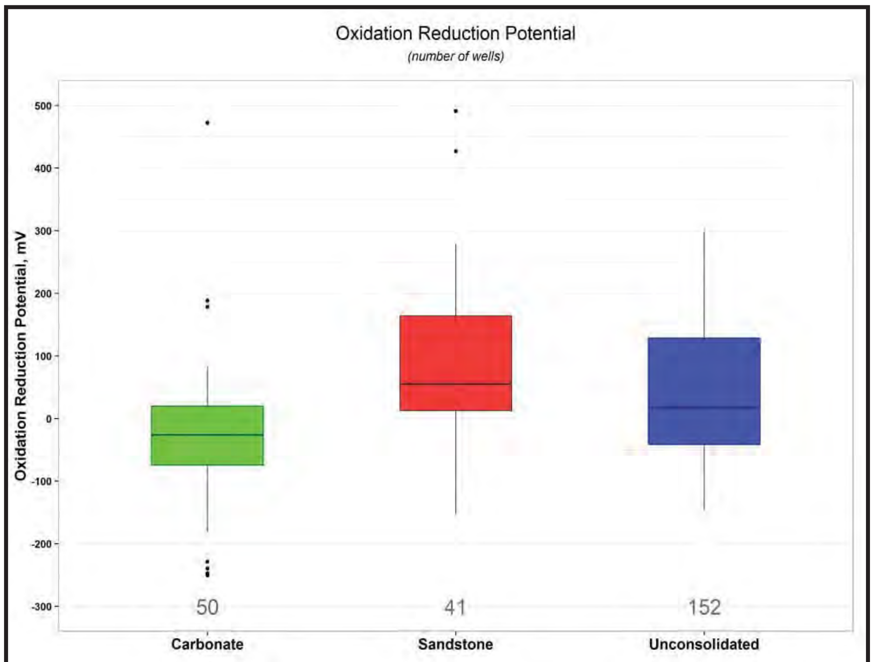
Explanation of Box Plot construction.
Box and Whisker Plots are an efficient graphical method for displaying the distribution of a data set. The format allows easy comparison of one distribution to those of other groups of data. The elements of a typical boxplot are indicated in Figure 1. The "box" itself outlines the range of half the data (the 25th to 75th percentiles, called the Inter-Quartile Range, or IQR). The median of the data set (the 50th percentile) is indicated by a thick horizontal bar inside the box.

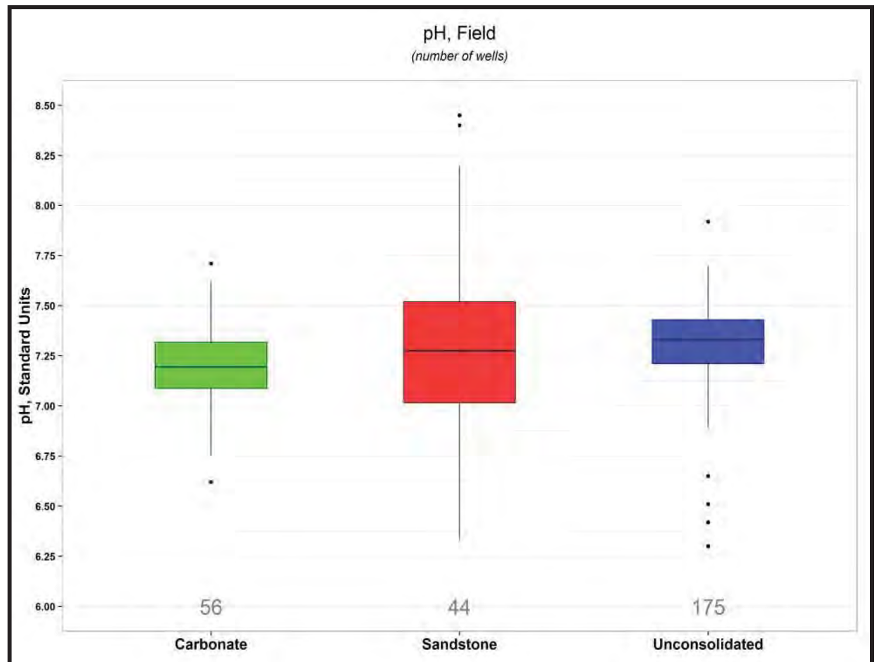
The whiskers are vertical lines extending from the top and bottom of the box, and indicate the range of data (which are not outliers) above and below the 75th and the 25th percentiles, respectively. The extent of the whiskers indicates the position of the last data point which does not exceed 1.5 times the IQR. Outliers exceed 1.5 times the IQR, and are identified by individual symbols above or below the whiskers.

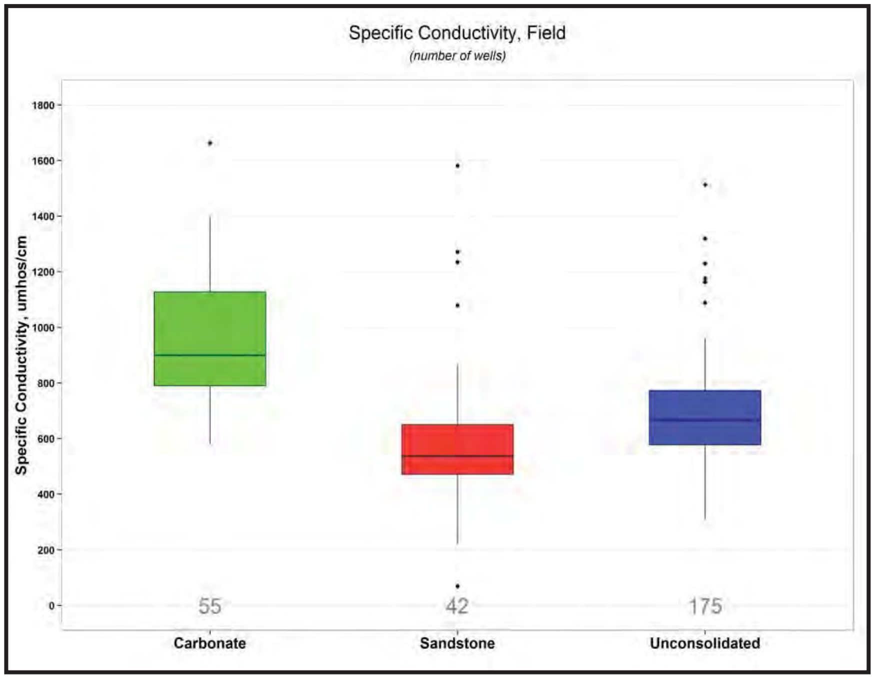
A normally distributed data set is indicated if the median bar is located mid-way between the top and bottom of the box, i.e. if the median is equidistant between the 25th and 75th percentiles. A skewed data set would have the median bar either closer to the 25th percentile (positively skewed) or to the 75th percentile (negatively skewed).

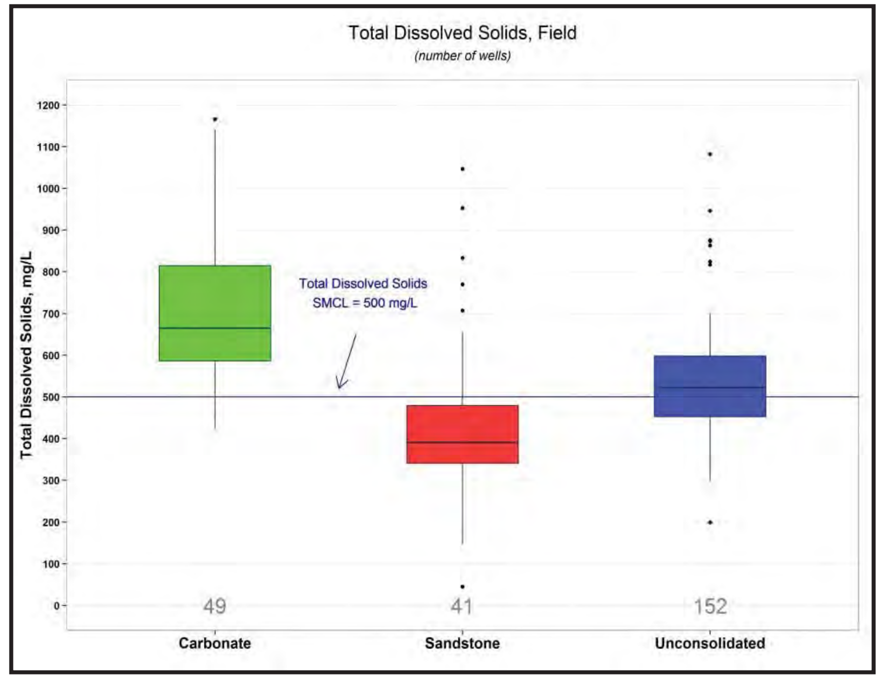
Field Parameters



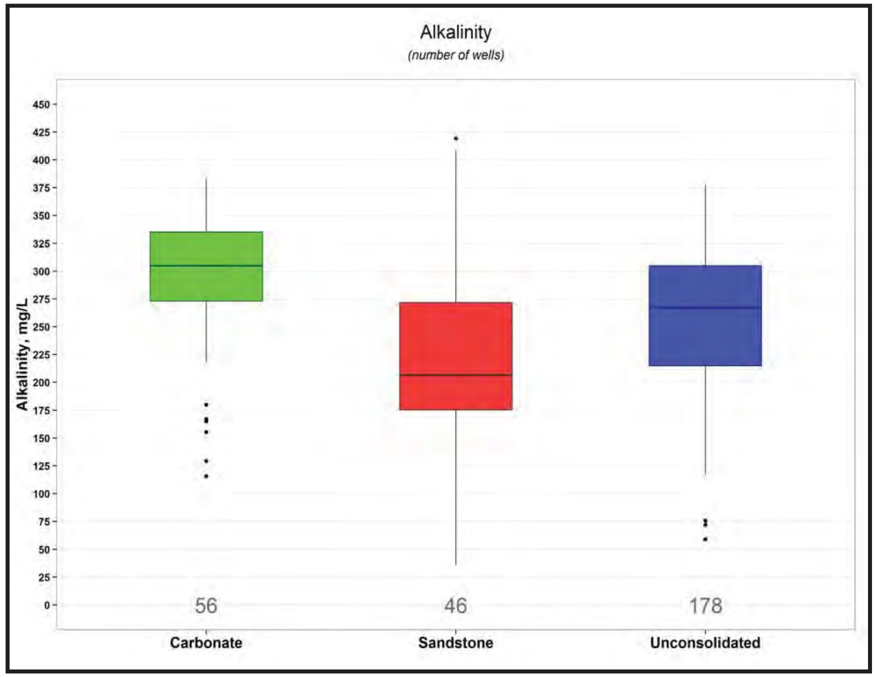


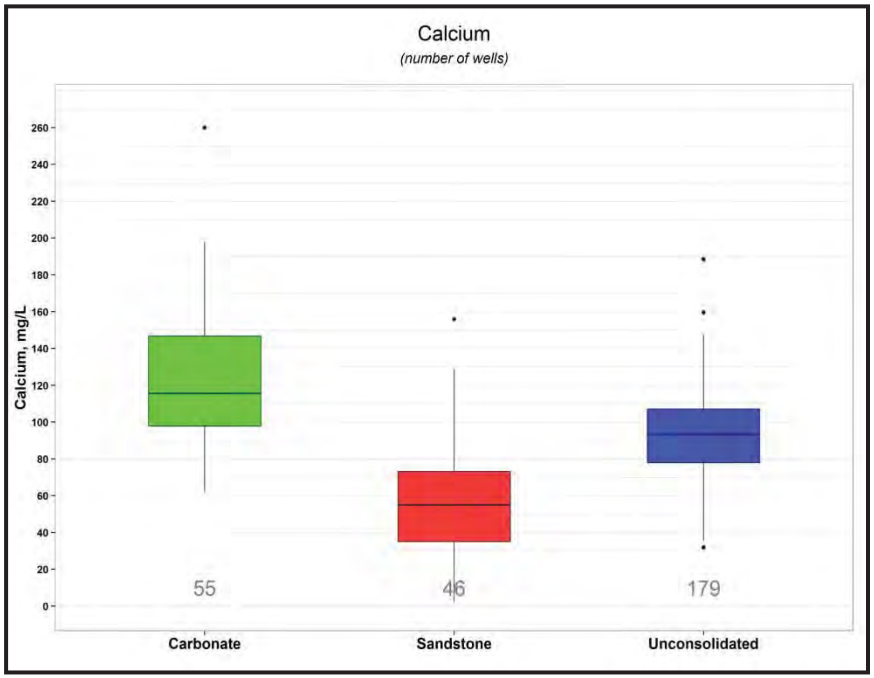


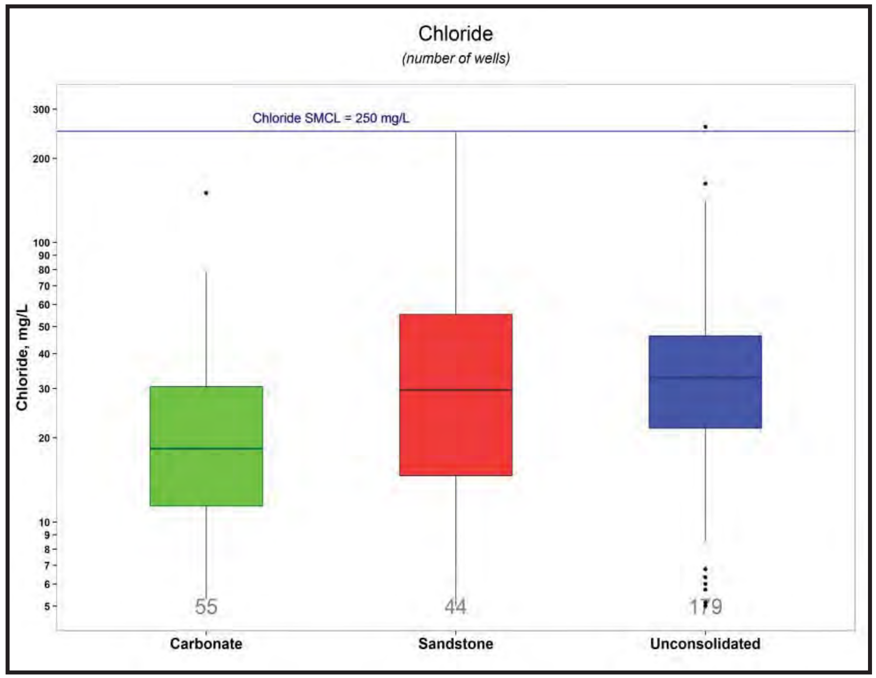

Specific Conductivity, Field
(number of wells)
Specific Conductivity, umhos/cm
1800
1600
1400
1200
1000
800
600
400
200
0
55
42
175
Carbonate
Sandstone
Unconsolidated

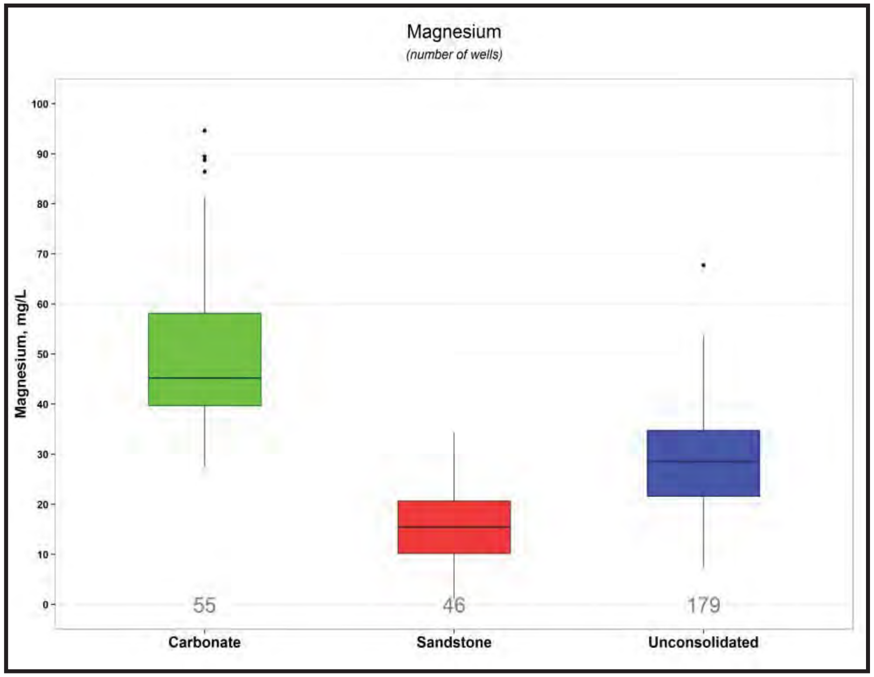

Total Dissolved Solids, Field
(number of wells)
Total Dissolved Solids, mg/L
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
Total Dissolved Solids
SMCL = 500 mg/L
49
41
152
Carbonate
Sandstone
Unconsolidated

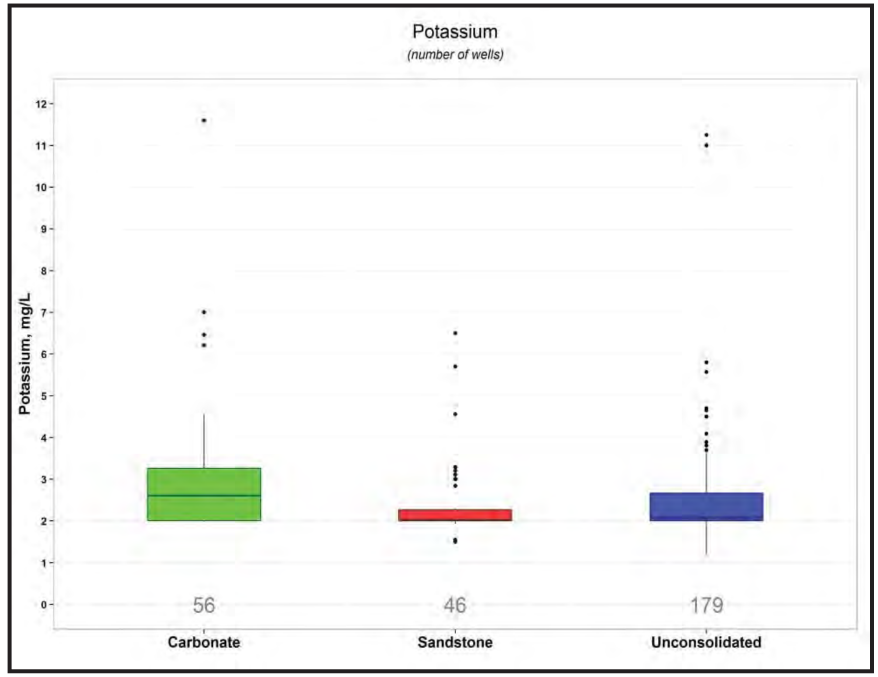
Major Constituents

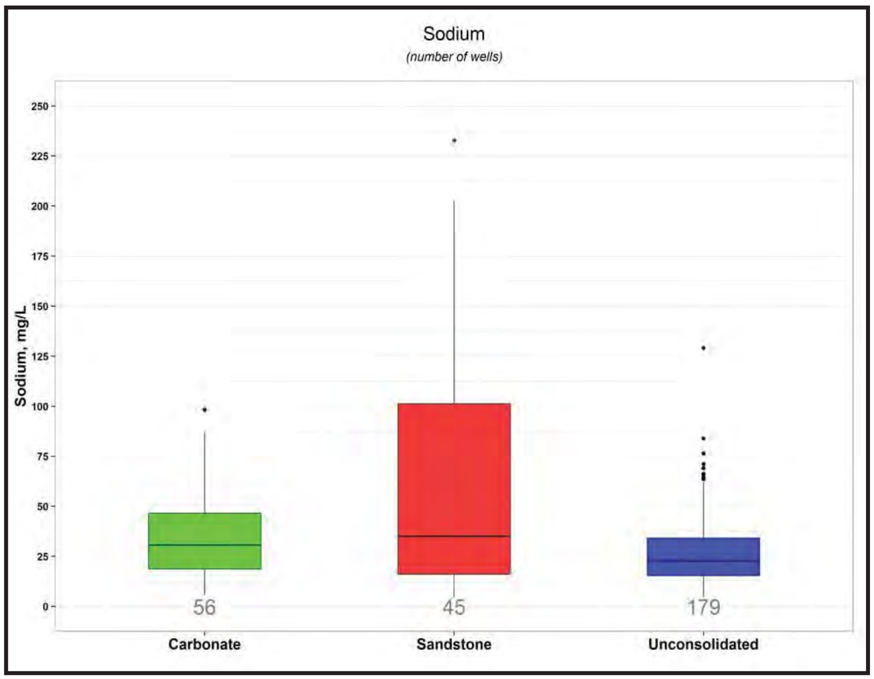


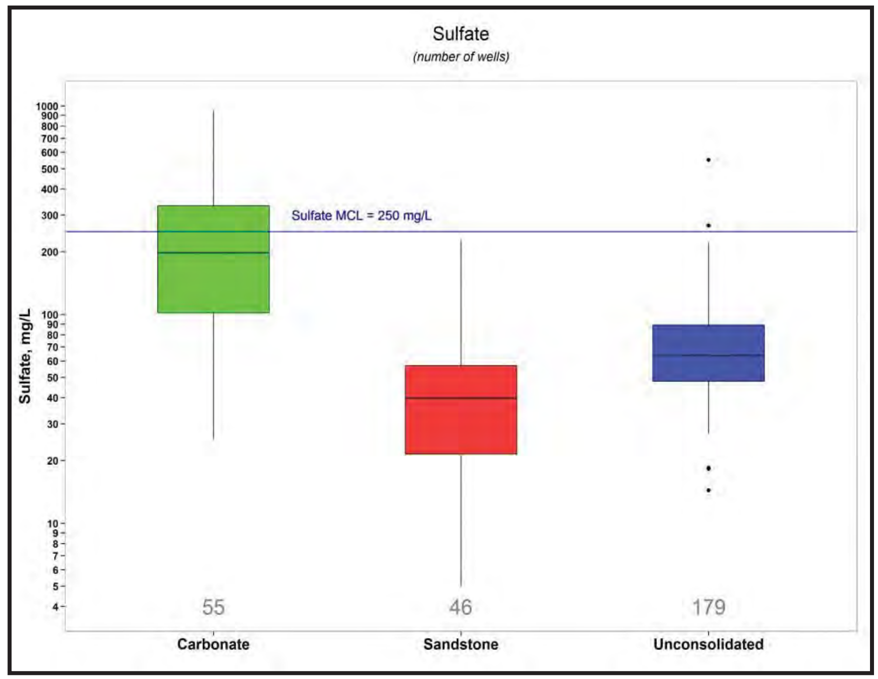


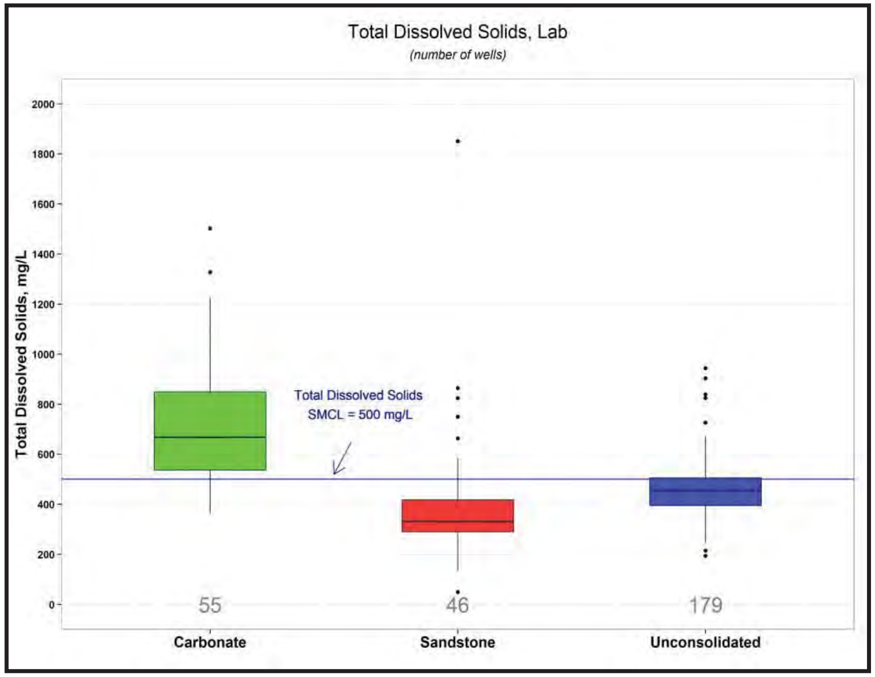



Magnesium
(number of wells)
Magnesium, mg/L
55
46
179
Carbonate
Sandstone
Unconsolidated


Potassium
(number of wells)
Potassium, mg/L
56
46
179
Carbonate
Sandstone
Unconsolidated

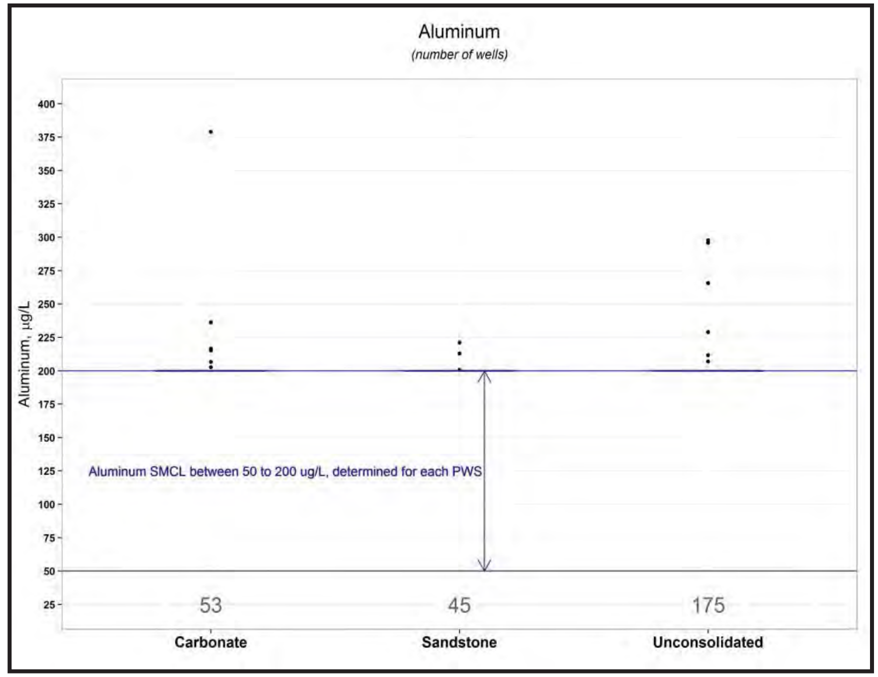

Sodium
(number of wells)
Sodium, mg/L
56
45
179
Carbonate
Sandstone
Unconsolidated

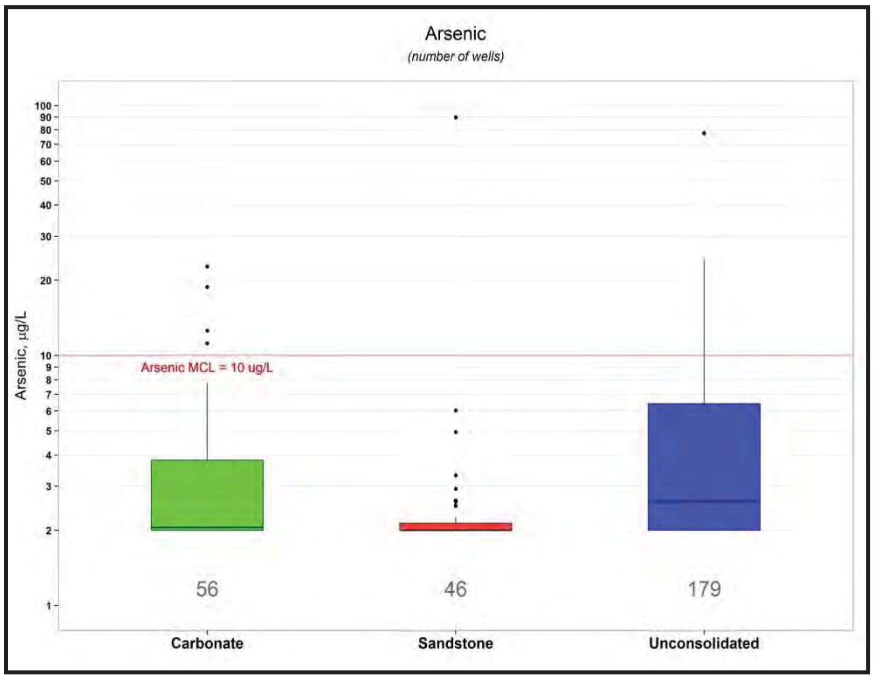

Sulfate
(number of wells)
Sulfate, mg/L
Sulfate MCL = 250 mg/L
55
46
179
Carbonate
Sandstone
Unconsolidated

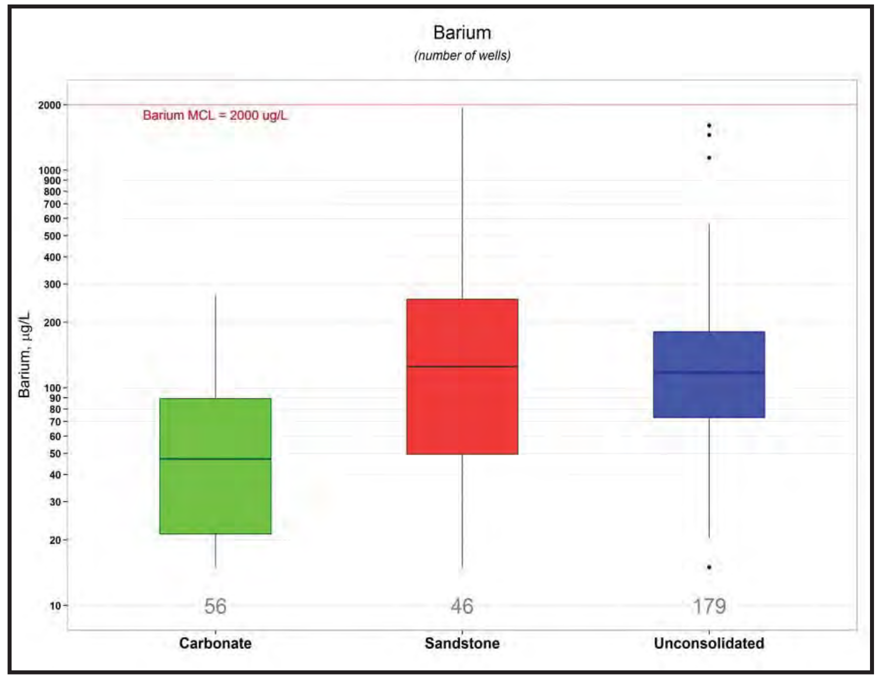


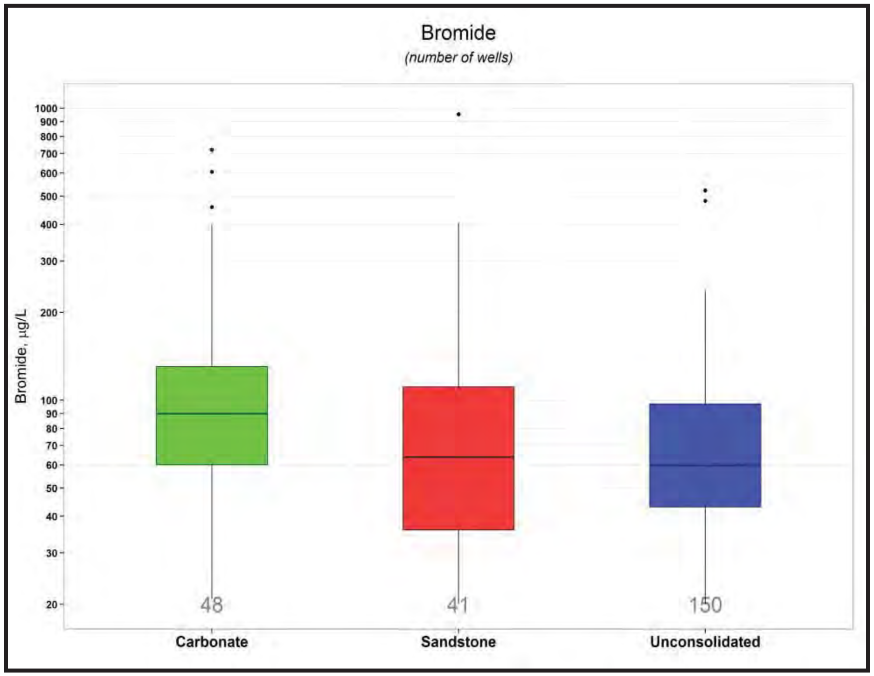
Total Dissolved Solids, Lab
(number of wells)
Total Dissolved Solids, mg/L
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Total Dissolved Solids
SMCL = 500 mg/L
55
46
179
Carbonate
Sandstone
Unconsolidated

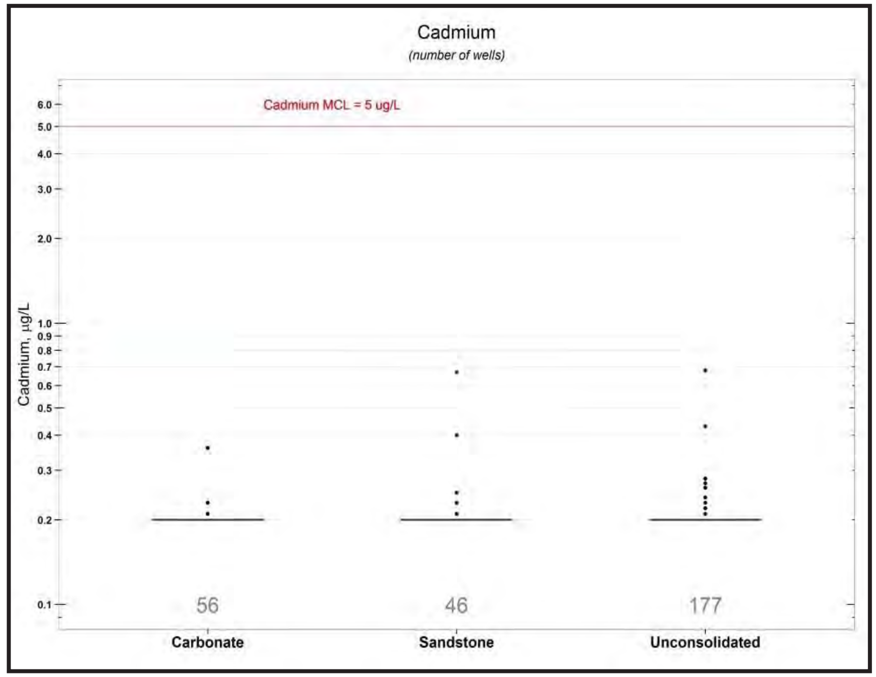
Trace Constituents

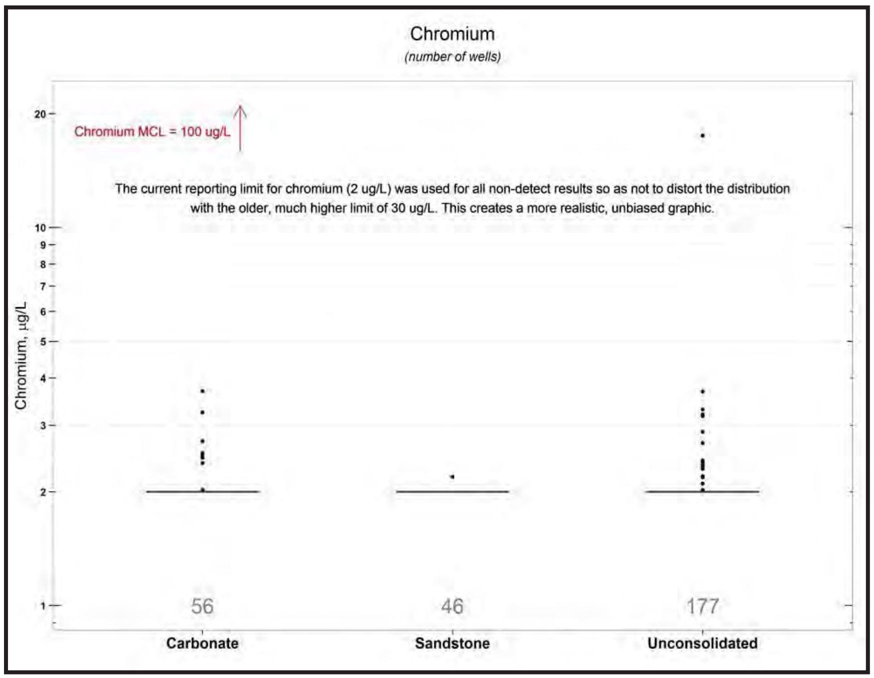


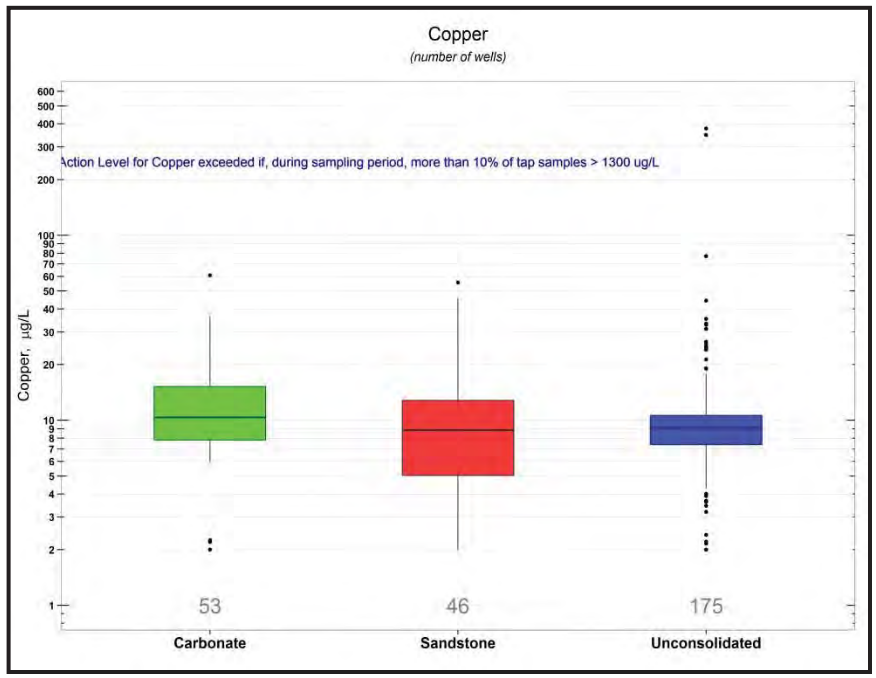


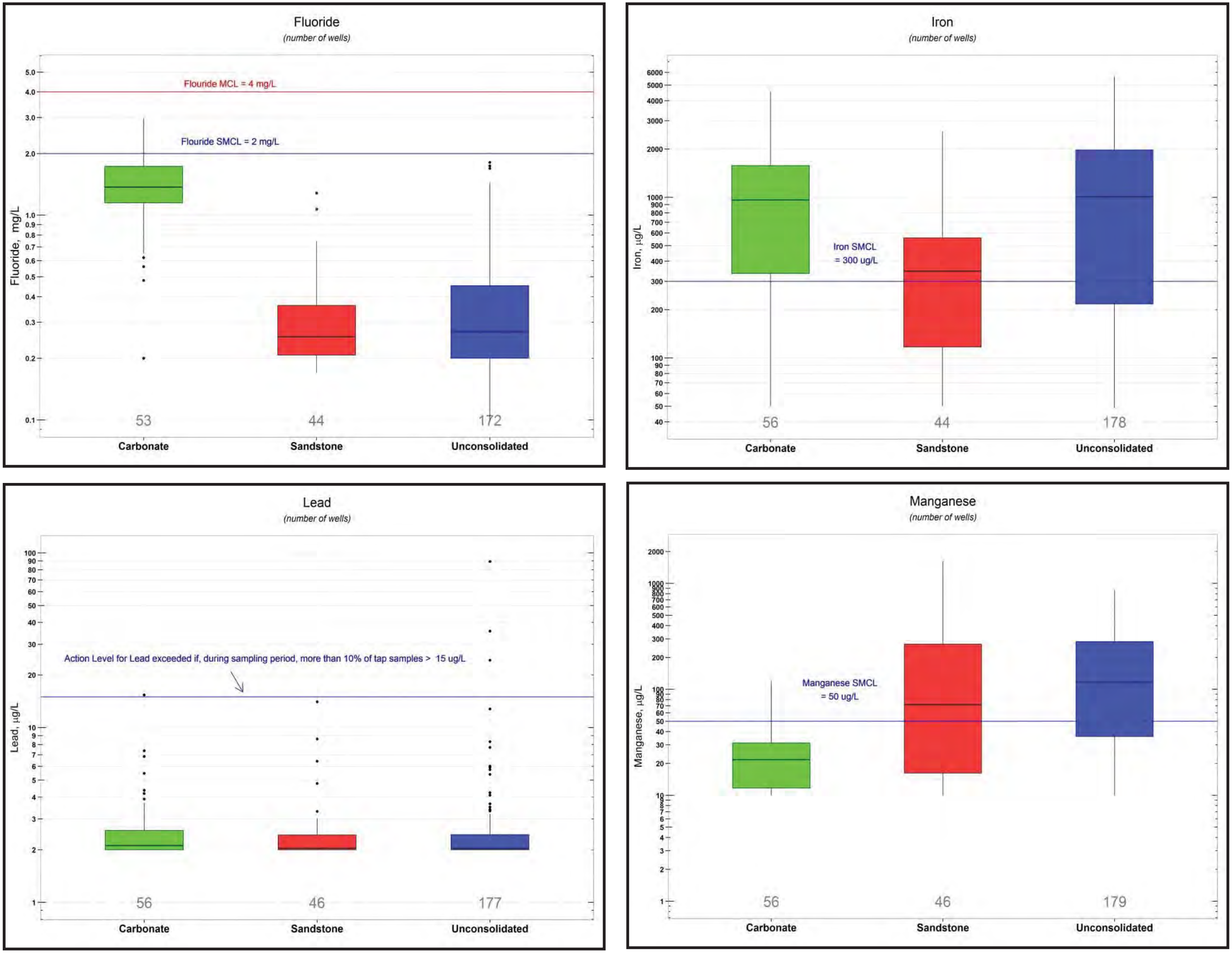


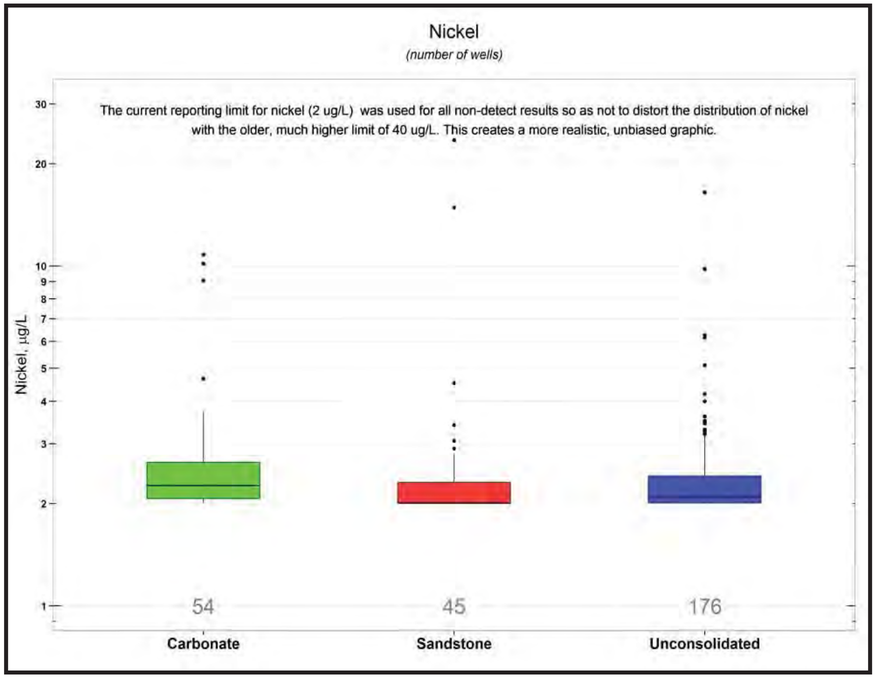

Bromide
(number of wells)
Bromide, µg/L
48
41
150
Carbonate
Sandstone
Unconsolidated


Cadmium
(number of wells)
Cadmium MCL = 5 ug/L
Cadmium, µg/L
56
46
177
Carbonate
Sandstone
Unconsolidated

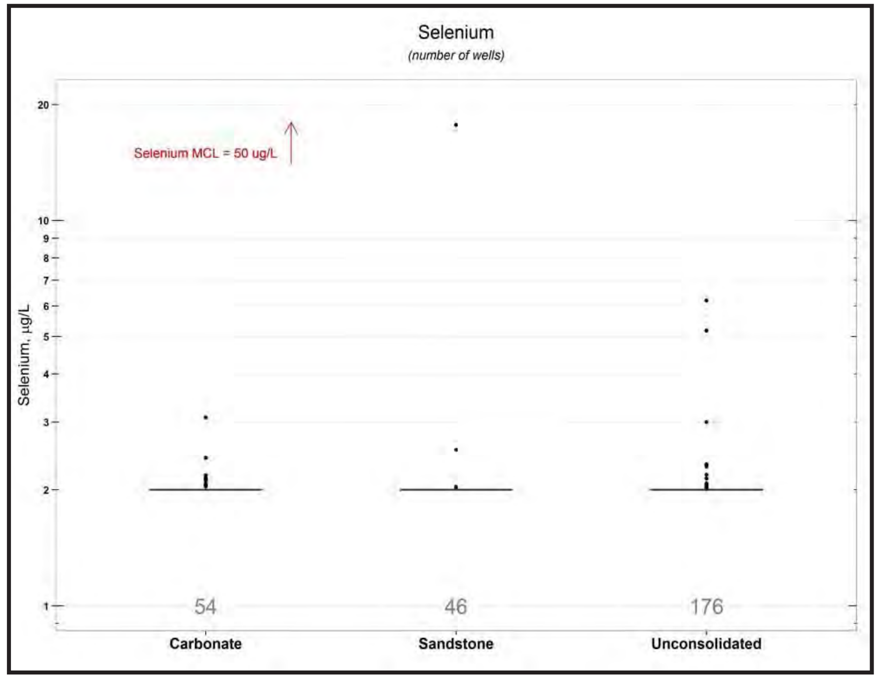

Chromium
(number of wells)
Chromium MCL = 100 ug/L
The current reporting limit for chromium (2 ug/L) was used for all non-detect results so as not to distort the distribution with the older, much higher limit of 30 ug/L. This creates a more realistic, unbiased graphic.
Chromium, µg/L
56
46
177
Carbonate
Sandstone
Unconsolidated


Copper
(number of wells)
Action Level for Copper exceeded if, during sampling period, more than 10% of tap samples > 1300 ug/L
Copper, µg/L
53
46
175
Carbonate
Sandstone
Unconsolidated

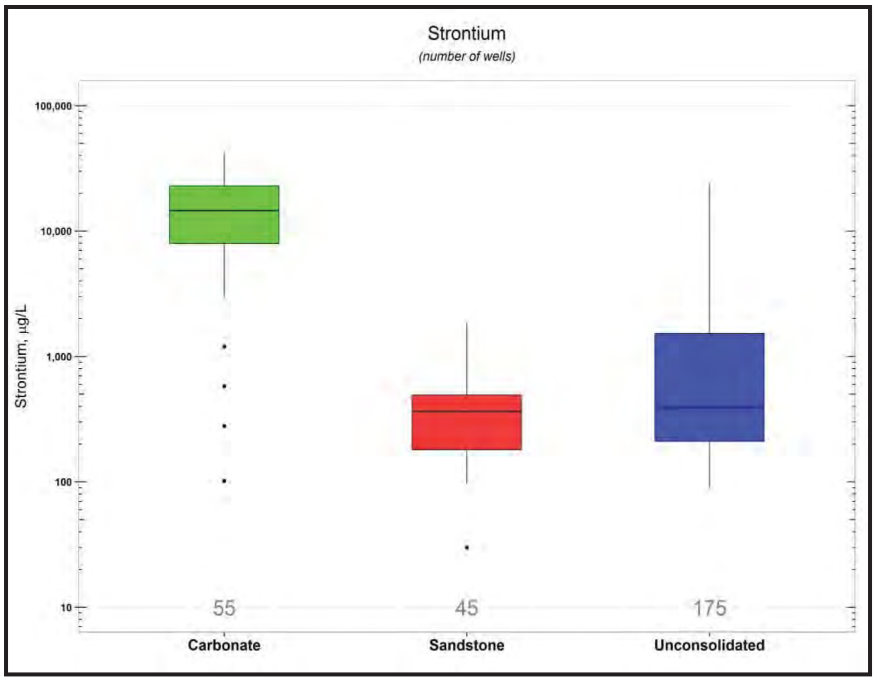

Fluoride
(number of wells)
Fluoride, mg/L
Flouride MCL = 4 mg/L
Flouride SMCL = 2 mg/L
53
44
172
Carbonate
Sandstone
Unconsolidated
Iron
(number of wells)
Iron, µg/L
Iron SMCL
= 300 ug/L
56
44
178
Carbonate
Sandstone
Unconsolidated
Lead
(number of wells)
Lead, µg/L
Action Level for Lead exceeded if, during sampling period, more than 10% of tap samples > 15 ug/L
56
46
177
Carbonate
Sandstone
Unconsolidated
Manganese
(number of wells)
Manganese, µg/L
Manganese SMCL
= 50 ug/L
56
46
179
Carbonate
Sandstone
Unconsolidated



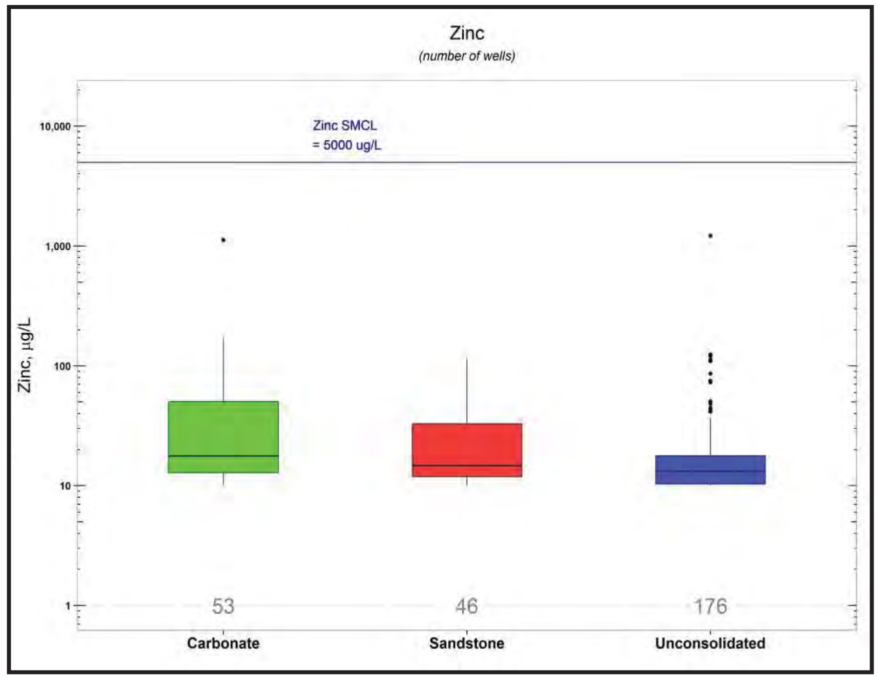
Nickel
(number of wells)
The current reporting limit for nickel (2 ug/L) was used for all non-detect results so as not to distort the distribution of nickel with the older, much higher limit of 40 ug/L. This creates a more realistic, unbiased graphic.
Nickel, µg/L
54
45
176
Carbonate
Sandstone
Unconsolidated



Selenium
(number of wells)
Selenium MCL = 50 ug/L
Selenium, µg/L
54
46
176
Carbonate
Sandstone
Unconsolidated

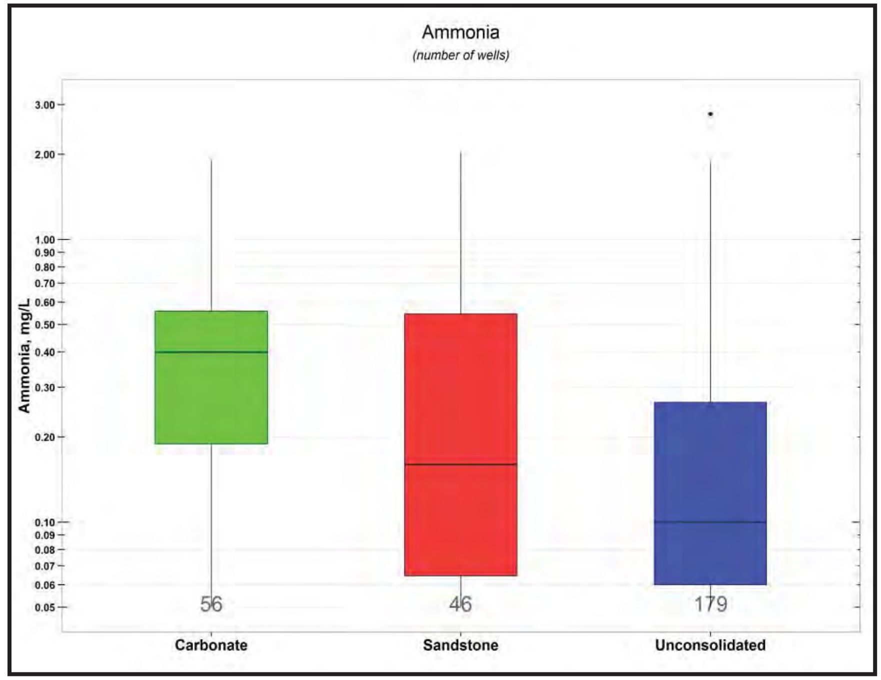


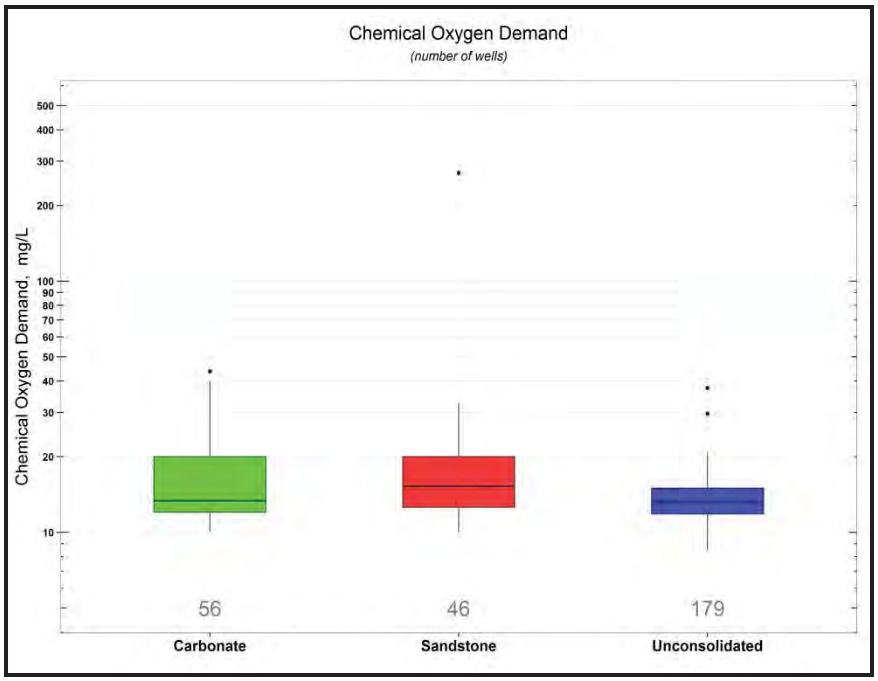
Strontium
(number of wells)
Strontium, µg/L
55
45
175
Carbonate
Sandstone
Unconsolidated

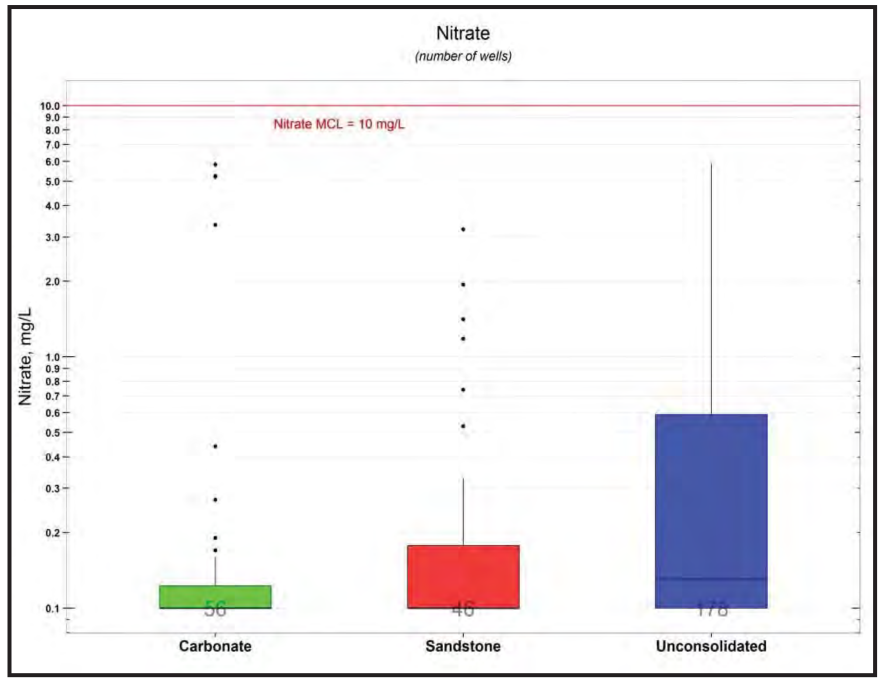


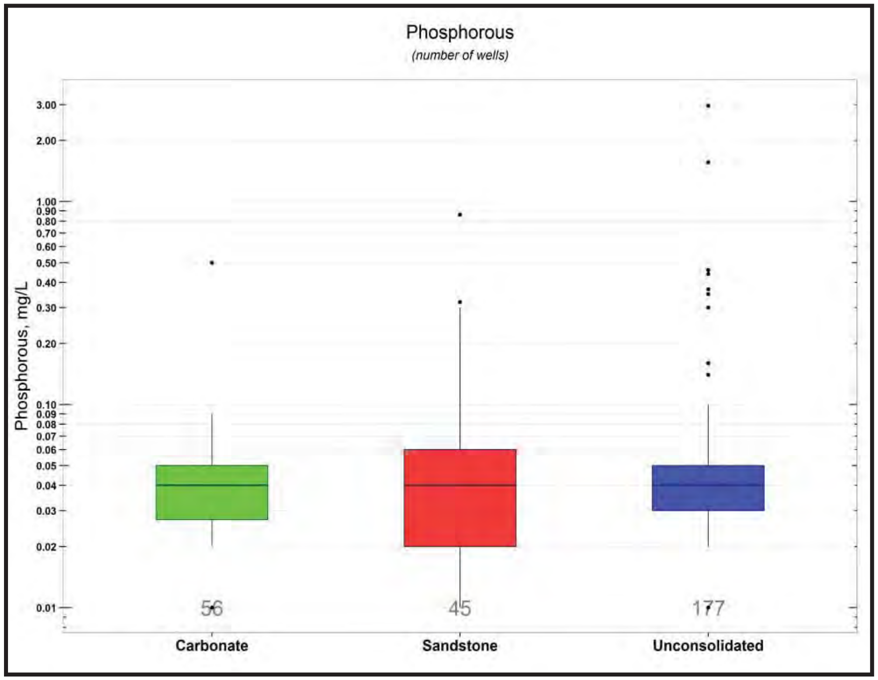
Zinc
(number of wells)
Zinc SMCL
= 5000 ug/L
Zinc, µg/L
53
46
176
Carbonate
Sandstone
Unconsolidated

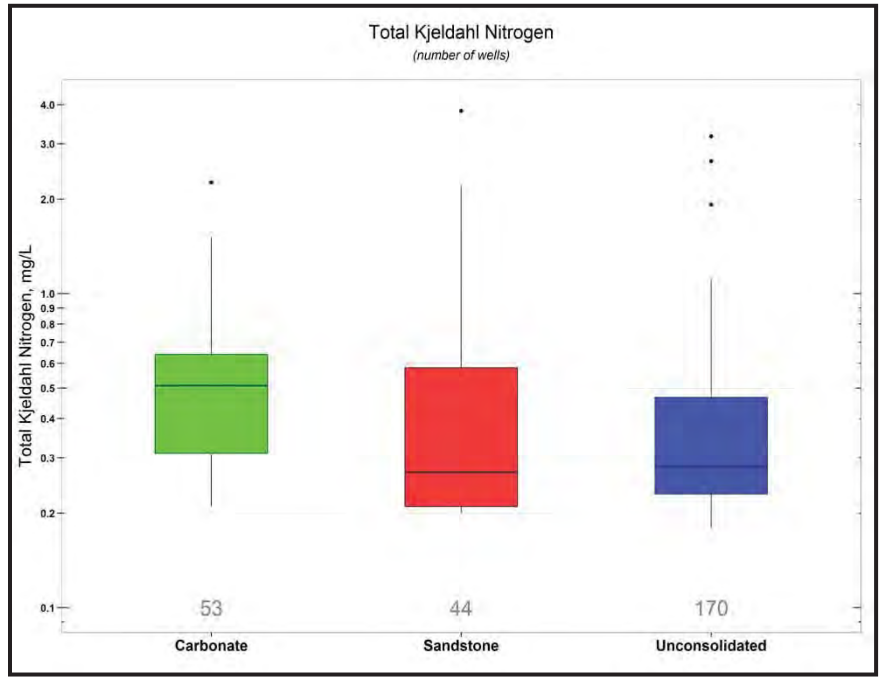
Nutrients

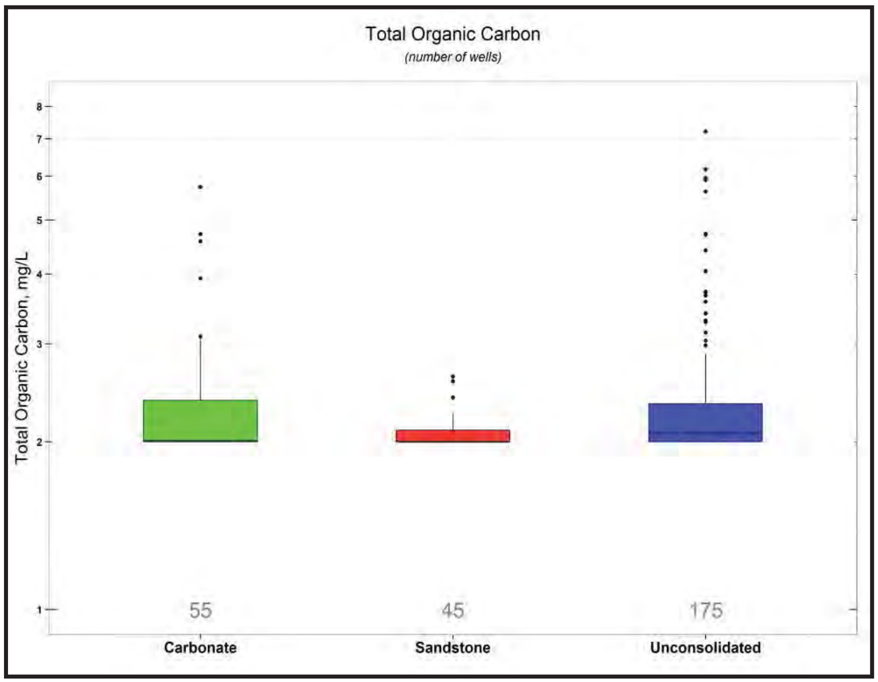

Ammonia
(number of wells)
Ammonia, mg/L
3.00
2.00
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.09
0.08
0.07
0.06
0.05
56
46
179
Carbonate
Sandstone
Unconsolidated


Chemical Oxygen Demand
(number of wells)
Chemical Oxygen Demand, mg/L
500
400
300
200
100
90
80
70
60
50
40
30
20
10
56
46
179
Carbonate
Sandstone
Unconsolidated


Nitrate
(number of wells)
Nitrate MCL = 10 mg/L
Nitrate, mg/L
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
56
46
178
Carbonate
Sandstone
Unconsolidated


Phosphorous
(number of wells)
Phosphorous, mg/L
56
45
177
Carbonate
Sandstone
Unconsolidated


Total Kjeldahl Nitrogen
(number of wells)
Total Kjeldahl Nitrogen, mg/L
53
44
170
Carbonate
Sandstone
Unconsolidated


Total Organic Carbon
(number of wells)
Total Organic Carbon, mg/L
55
45
175
Carbonate
Sandstone
Unconsolidated

Section

N

References

N References

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